PROGRESSIVE WEDICINE





Presented to

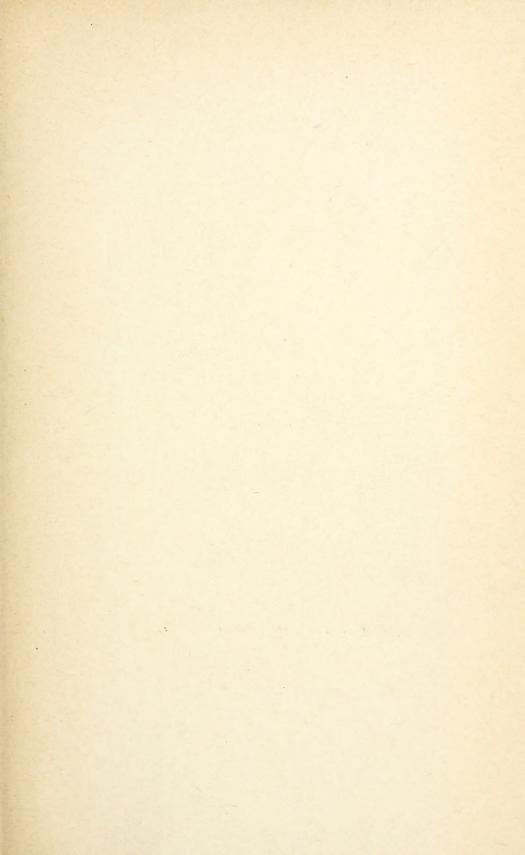
The Library

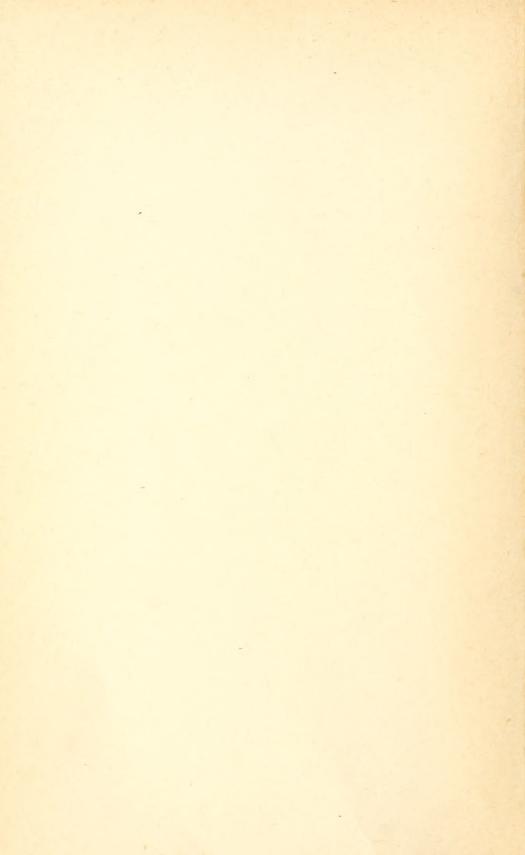
of the

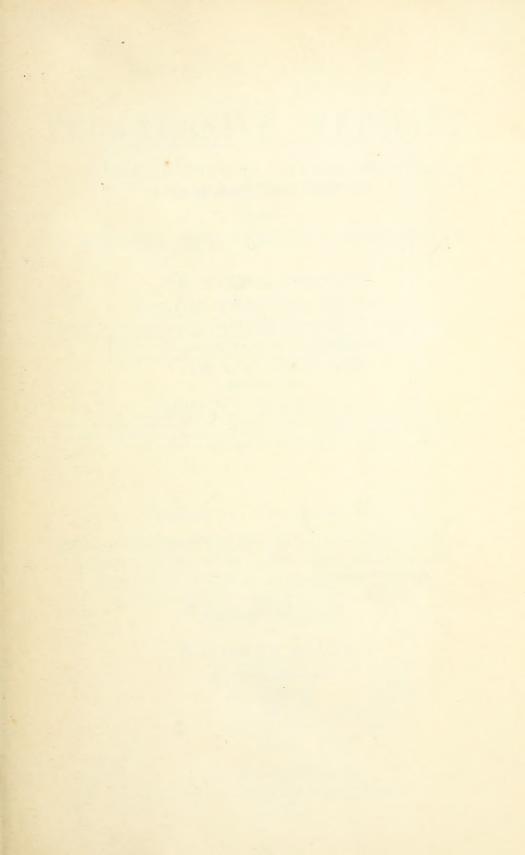
University of Toronto

by

Academy of Medicine







CONTRIBUTORS TO VOLUME IV

BLOODGOOD, JOSEPH C., M.D.
BONNEY, CHARLES W., M.D.
CHRISTIAN, HENRY A., M.D.
LANDIS, H. R. M., M.D.
REHFUSS, MARTIN E., M.D.

PUBLISHED QUARTERLY

BY

LEA & FEBIGER

706–710 Sansom Street Philadelphia Med.

Awarded Grand Prize, Paris Exposition, 1900

PROGRESSIVE MEDICINE

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES
AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES

EDITED BY

HOBART AMORY HARE, M.D.

PROFESSOR OF THERAPEUTICS, MATERIA MEDICA, AND DIAGNOSIS IN THE JEFFERSON MEDICAL COLLEGE,
PHILADELPHIA; PHYSICIAN TO THE JEFFERSON MEDICAL COLLEGE HOSPITAL; ONE TIME CLINICAL
PROFESSOR OF DISEASES OF CHILDREN IN THE UNIVERSITY OF PENNSYLVANIA;

MEMBER OF THE ASSOCIATION OF AMERICAN PHYSICIANS, ETC.

ASSISTED BY

LEIGHTON F. APPLEMAN, M.D.

INSTRUCTOR IN THERAPEUTICS, JEFFERSON MEDICAL COLLEGE, PHILADELPHIA; OPHTHALMOLOGIST TO THE
FREDERICK DOUGLASS MEMORIAL HOSPITAL AND TO THE BURD SCHOOL; OPHTHALMOLOGIST
TO THE POLYCLINIC SECTION OF THE UNIVERSITY OF PENNSYLVANIA

VOLUME IV. DECEMBER, 1918

DISEASES OF THE DIGESTIVE TRACT AND ALLIED ORGANS, THE LIVER, PANCREAS AND PERITONEUM—DISEASES OF THE KIDNEYS—GENITO-URINARY DISEASES—SURGERY OF THE EXTREMITIES, SHOCK, ANESTHESIA, INFECTIONS, FRACTURES AND DISLOCATIONS, AND TUMORS—PRACTICAL THERAPEUTIC REFERENDUM



LEA & FEBIGER
PHILADELPHIA AND NEW YORK
1918

Copyright LEA & FEBIGER 1918

LIST OF CONTRIBUTORS

JOSEPH C. BLOODGOOD, M.D.,

Associate Professor of Surgery, Johns Hopkins University, Baltimore, Md.

CHARLES W. BONNEY, M.D.,

Demonstrator of Topographical and Applied Anatomy in the Jefferson Medical College, Philadelphia.

HENRY A. CHRISTIAN, M.D.,

Professor of Medicine in Harvard University, and Physician-in-Chief to the Peter Bent Brigham Hospital, Boston, Mass.

JOHN G. CLARK, M.D.,

Professor of Gynecology in the University of Pennsylvania, Philadelphia.

GEORGE M. COATES, A.B., M.D.,

Surgeon to the Out-Patient Department for Diseases of the Ear, Throat, and Nose of the Pennsylvania Hospital; Professor of Diseases of the Ear in the Philadelphia Polyclinic; Laryngologist to the Tuberculosis Department of the Philadelphia General Hospital; Consulting Laryngologist to the Philadelphia Orphanage.

WILLIAM B. COLEY, M.D.,

Professor of Clinical Surgery, Cornell University Medical School; Attending Surgeon to the General Memorial Hospital for the Treatment of Cancer and Allied Diseases; Attending Surgeon to the Hospital for Ruptured and Crippled, New York.

FLOYD M. CRANDALL, M.D.,

Consulting Physician to the Infants' and Children's Hospital; Late Visiting Physician to Minturn Hospital, New York.

EDWARD P. DAVIS, M.D.,

Professor of Obstetrics in the Jefferson Medical College of Philadelphia.

WILLIAM EWART, M.D., F.R.C.P.,

Consulting Physician to St. George's Hospital and to the Belgrave Hospital for Children, London.

CHARLES H. FRAZIER, M.D.,

Professor of Clinical Surgery in the University of Pennsylvania; Surgeon to the University, Howard, and Philadelphia Hospitals.

WILLIAM S. GOTTHEIL, M.D.,

Adjunct Professor of Dermatology, New York Post-Graduate Medical School; Consulting Dermatologist to Beth Israel and Washington Heights Hospitals; Visiting Dermatologist to the City and Lebanon Hospitals, New York City.

EDWARD JACKSON, M.D.,

Professor of Ophthalmology in the University of Colorado; Ophthalmologist to the City and County Hospital of Denver.

H. R. M. LANDIS, M.D.,

Director of the Clinical and Sociological Departments of the Henry Phipps Institute of the University of Pennsylvania; Assistant Professor of Medicine in the University of Pennsylvania; Visiting Physician to the White Haven Sanatorium.

GEORGE P. MÜLLER, M.D.,

Associate in Surgery in the University of Pennsylvania; Professor of Surgery in the Philadelphia Polyclinic and College for Graduates in Medicine; Surgeon to the St. Agnes and Polyclinic Hospitals; Assistant Surgeon to the Hospital of the University of Pennsylvania; Consulting Surgeon to the Chester County Hospital.

O. H. PERRY PEPPER, M.D.,

Associate in Medicine and Research Medicine in the Medical School of the University of Pennsylvania; Assistant Visiting Physician to the Hospital of the University of Pennsylvania.

MARTIN E. REHFUSS, M.D.,

Instructor in Medicine; Associate in Physiological Chemistry in the Jefferson Medical College, Philadelphia.

JOHN RUHRÄH, M.D.,

Professor of Diseases of Children and Therapeutics, College of Physicians and Surgeons; Visiting Physician, Robert Garrett Hospital, Nursery and Child's Hospital, Mercy Hospital; Consulting Physician, Church Home and Infirmary, Baltimore.

WILLIAM G. SPILLER, M.D.,

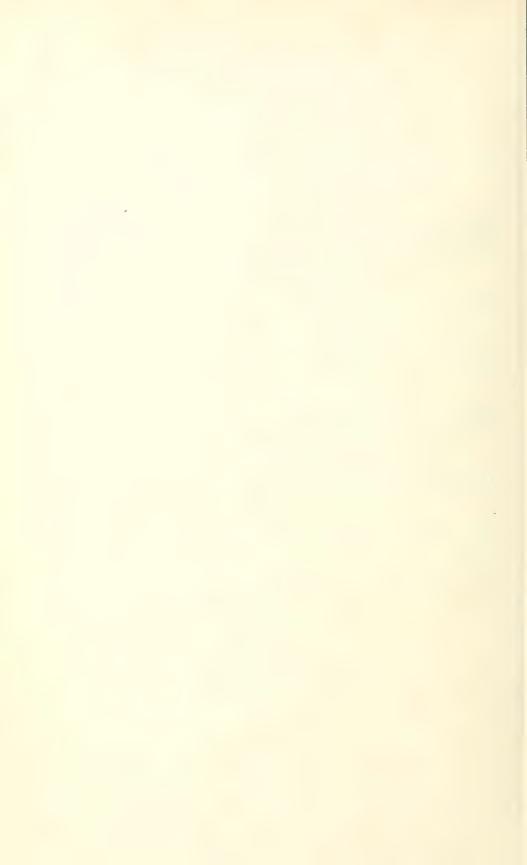
Professor of Neurology in the University of Pennsylvania; Clinical Professor of Nervous Diseases in the Woman's Medical College of Pennsylvania.

ABRAHAM O. WILENSKY, M.D.,

Visiting Surgeon, Beth David Hospital; Adjunct-Attending Surgeon, Mount Sinai Hospital; Assistant in Surgical Pathology, Mount Sinai Hospital Pathological Laboratory.

CONTENTS OF VOLUME IV

DISEASES OF THE DIGESTIVE TRACT AND ALLIED ORGANS,	1 '7
THE LIVER, PANCREAS AND PERITONEUM	14
By MARTIN E. REHFUSS, M.D.	
DISEASES OF THE KIDNEYS	13 5
By HENRY A. CHRISTIAN, M.D.	
GENITO-URINARY DISEASES	159
By CHARLES W. BONNEY, M.D.	
SURGERY OF THE EXTREMITIES, SHOCK, ANESTHESIA, INFEC-	
TIONS, FRACTURES AND DISLOCATIONS, AND TUMORS .	211
By JOSEPH C. BLOODGOOD, M.D.	
PRACTICAL THERAPEUTIC REFERENDUM	315
By H. R. M. LANDIS, M.D.	
INDEX	407



PROGRESSIVE MEDICINE.

DECEMBER, 1918.

DISEASES OF THE DIGESTIVE TRACT AND ALLIED ORGANS, THE LIVER, PANCREAS, AND PERITONEUM.

By MARTIN E. REHFUSS, M.D.

The present crises in the nation's history demands every available resource. A mobilization of all the forces—military, economic, medical—demands the utmost efficiency in every phase of activity. Already thousands of physicians throughout the country have answered the call, and, for the civilian, work will be at a standstill. They are called upon to meet the peculiar exigencies incident to a great struggle, such as the present. It is therefore a particular source of pride to know that gastroenterologists everywhere have responded to the task, and the Surgeon-General has recognized the necessity for this speciality in creating a section of gastro-enterology in the division of Internal Medicine, in charge of Major Seale Harris. It is therefore particularly fitting that a large part of this review be devoted to the military aspect of gastrointestinal conditions. This war has served to focus the perspective more directly on intestinal than gastric disturbances. It has stimulated investigation of the various forms of enteritis, enterocolitis, the various dysenteries, the parasitic intestinal conditions, the increased frequency of infectious jaundice and the prevalence of carriers everywhere (Studies in New York and Nashville) capable of inducing an epidemic of this disease. Among the most important questions studied are those dealing with prophylaxis and immunization.

Where the articles justified it, portions were abstracted word for word, others have been almost totally neglected. General summaries, which constitute a favorite form of exploitation, and literary plagiarism have found no place in this review. More than one-half of the articles contributed are by men in active military service, and therefore reflect the conditions which are likely to be encountered in the field. The technic in the preparation of intestinal vaccines (Bertholet), transduodenal lavage, the determination of intragastric conductance, the examination of the Spirochetæ icterohemorrhagiæ, the determination of urobilin, uribilinogen, and the local application of magnesium sulphate in spastic constipation are given in detail. Of particular interest are the questions

of reversed peristalsis, the effects of antacids, the interesting and most complete studies of Smithies on the effects of gastro-enterostomy, and the question of protective multiple inoculations among the troops, as

extolled by Vastellani and Taylor.

The gastro-intestinal problems dealing with the war are naturally of paramount consideration. The desirability of carefully studying these cases is apparent from some of the French reports, there being present a number of cases in which gastro-intestinal conditions have demanded treatment. The questions of fatigue and shock on gastro-intestinal function, food infection, the effects of various dietaries on the efficiency of the troops, and the incidence of gastro-intestinal phenomena among large bodies of enlisted men are important. Under capable medical supervision, these data and statistics alone would be of great value. A certain group of cases which come up before the military physician, as well as the men serving on the local and War Advisory Boards, is that showing pronounced visceroptosis, marked vasomotor disturbances, and a highly sensitive neurovascular mechanism.

The effects of military training is to be carefully noted on these cases, and the present time offers unparalled opportunities for their solution. At the present time, but particularly after the war, the question of physical reconstruction naturally occupies the medical mind, and the elimination of focal infections, and parasitic and bacterial carriers are not the

least among the problems which must be met with.

The inevitable result of this war will be a tremendous impetus to scientific study, and the logical conclusion that America is preëminently suited to be the Mecca for post-graduate study. It is becoming manifest. as was realized by many thoughtful observers even before the war, that Germany will no longer be a center for post-graduate study, but that the rich, unculled fields of France and England, as well as the great clinics in America, will attract the student. It is to be hoped that the dissemination of the English tongue, as well as the knowledge of the French language gained by thousands of medical men at first hand, will serve to promote a mutual reciprocation among the students of the Allied countries. It is to be regretted that in the last year the dean of French gastro-enterologists, Albert Mathieu, died. But many men are left to fill the ranks, not the least among them being Roux, Loeper, Goiffon, Chauffard, Tessier, and others. The idealism and faithful consecration to duty, as well as the earnest and unselfish longing for the truth, which dominates the French school, will be a great stimulus in directing the policies of American medicine. The ability of American investigators to carry on the problems of the future can be safely entrusted to those who have been tried by fire, and whose vision has been tempered by a little of the French esprit, to bring into closer relationship the intimate ties which binds these great countries.

DISEASES OF THE MOUTH.

Infections of the Mouth. Infections of the mouth play an important part wherever large bodies of men are gathered together. It is, there-

fore, not surprising that mouth infections should be reported among the troops and that the care of the mouth constitutes an important prophylactic measure. McKinistry gives the results of the study of Vincent's angina, which is reported in full in this review. Emrys Roberts uses the following treatment as a local application:

Liquoris hy	dı	og	enii	die	oxid	i						150	ounces 4
Vini ipecac.								٠				12	drams 3
Glycerini .												15	drams 5
Aquæ									q.	. S.	ad	240	ounces 8

Gingivitis is usually cured in about six days by this treatment, and the throat condition is supposed to clear up altogether in twenty-four to

forty-eight hours.

Pyorrhea is another frequent condition demanding not merely treatment, but prophylaxis. The local use of the arsenic and ipecac preparations, such as the combination of liquor potassii arsenitis and vinum

ipecacuanhæ is efficacious.

The importance of these conditions is evident when it is realized that a great many of the visceral complications are due to the swallowing and dissemination of bacteria from the mouth. The reviewer described the condition known as Gastric Infection in the September number of the Clinics of North America, in which it was pointed out that direct infection of the gastric mucous membrane can occur through the swallowing of infected material and particularly through the medium of infected foci of the mouth.

Vincent's Angina. The prevalence of this disease among soldiers and the fact that these conditions are to be found in many mouths will emphasize the necessity for a thorough summary of the condition. McKinistry¹ contributes an excellent article on the condition, from which the following points of most importance have been abstracted:

Seasonal Variations. Acute tonsillar affections in this country usually show a seasonal variation, occurring most frequently in the spring and autumn. J. D. Rolleston published a paper on 32 cases of Vincent's angina observed in children, and therein stated he found Vincent's angina commonest in spring and rarest in autumn.

Below are monthly tables of the numbers of cases of Vincent's angina and fuso-spirochetal ulcerations of the gums met with at Queen Alex-

andra Military Hospital during the year 1916.

TABLE OF CASES OF VINCENT'S ANGINA.

January					16	July							6
February .					2	August .						٠	13
March					6	September				٠			19
April					13	October .							11
May					6	November					,		24
June					3	December						٠	38
TABLE OF CA	SES OF	FU	SO-S	SPI	ROCHI	ETAL ULCE	RAT	101	1 0	F	THE	G	UMS.
January					30	July							16
January February .					30 19	July August .							16 28
January February				1.	30 19 30	July August . September							16 28 28
January February				100	30 19 30 26	July August . September October .							16 28 28 25
January February .				100	30 19 30 26	July August . September October .							16 28 28 25

¹ Practitioner, 1917, xcix, 507.

From these tables it will be observed that the diseases are commonest during the winter months, and that the numbers of cases of Vincent's angina rise and fall with the cases of fuso-spirochetal ulceration of the gums. But it is to be remembered that as the conditions of life have so materially changed in the present state of stress, it is obviously unsafe to draw any general conclusion of seasonal variation from the tables.

Occupation and Age. Nearly all his cases occurred in soldiers.

There can be no doubt that oral sepsis plays a very important part; about 30 per cent. of the cases seen by me showed decayed teeth, and a larger proportion want of oral cleanliness. In a large number of the latter, the mouth-toilet had been discarded on account of the pain and the bleeding excited.

Infectivity. The affections do not appear to be highly infectious.

There can be no doubt that the disease can also be conveyed by the mouth pieces and holders of pipes, cigarettes, gas masks, and other articles coming in contact with the mouth, and I have found fusiform bacilli in smears taken from the inside of the mouth pieces of pipes and cigarette holders. Those modes of infection, however, account for only a few of the cases seen. Many of the cases were living at their homes or in billets removed from overcrowding and unsanitary conditions, and from whom no evidence of infection could be obtained.

He examined, microscopically, smears from the throats of 1320 healthy soldiers, and found fuso-spirochetal organisms in 32. He also examined smears from the gums of 230 healthy men, who had not yet started military life, and found no less than 95 positive. It thus looks as if these saprophytic organisms can, under certain conditions, become pathogenic. The proportion of "healthy carriers" is highly significant.

Exciting Cause. The affection is caused by an apparent association of a bacillus and spirochete. The bacillus, first called by Vincent the fusiform bacillus, is straight or slightly curved, and tapering at each end. It is about 4μ to 12μ in length and about 1μ in thickness.

The bacillus fusiformis is easily stained by the basic aniline dyes, particularly weak carbol-fuchsin. It is Gram-negative and anaërobic. In stained preparations, vacuoles are often seen, and frequently spore-like bodies can be made out if a film is stained by a warm carbol-fuchsin and decolorized in 1 per cent, sulphuric acid. Tunnicliff states they are situated at one end or near the center of the bacillus, and the development from the spore into the very short plump bacillus may be observed in a hanging drop.

The spirochete is a delicate organism, about 12μ to 30μ in length. It usually has five or six undulations of wide amplitude. It is quite distinct from the treponema pallidum, which is finer, with eight, ten or more undulations.

The spirochete Vincenti, as it is frequently called, is motile, and takes the stains like the fusiform bacillus; it is Gram-negative and anaërobic.

The fusiform bacillus and spirochete may easily be displayed by the following simple procedure: A smear is made from a fuso-spirochetal ulcer, dried, fixed, stained for a few minutes in diluted carbol-fuchsin,

dried, and examined under the oil-immersion lens, when fusiform, mixed up with cocci, bacilli, leptothrices and other organisms. Sometimes, in severe cases, almost pure cultures of the fusiform bacilli and spirochetæ will be found, but these will gradually decrease in numbers as the process of recovery advances. It should also be mentioned that some smears from a healthy mouth, fixed, stained and examined microscopically show quite a different picture from the smears from a fuso-spirochetal ulcer of the gums, throat, or mouth. In the former, the fusiform bacilli, if present, are few and far between, while in the latter they are numerous.

Symptoms. The patient rarely looks or feels ill. He usually complains of pain or discomfort in the throat, occasionally darting up to the ears, and increased on swallowing. He may have a headache and

indefinite pains in the limbs.

The temperature very rarely exceeds 100° F., and, when raised, usually subsides in a day or two. The pulse rate simply shows the usual relationship of fluctuation to temperature. The small amount of constitutional disturbance found is surprising, and forms a strong point in the diagnosis of the affection.

The lymphatic glands about the affected region are enlarged and

tender.

As a rule, the mouth can easily be opened, when the hard and soft palate will often be seen to be red and injected. If the tonsils are examined, one of two conditions will usually be found: (a) On the surface of one or both tonsils will be seen a soft, whitish, creamy-looking membrane, which can easily be removed with a swab, leaving behind a deep, ragged, or punched-out ulcer, with a bleeding base. This is the deep type of ulcer. (b) A thin, whitish membrane will be found covering part, or both tonsils, very difficult, or impossible, to remove by gentle brushing, but, if removed, leaving a bleeding ulcer. This is the diphtheroid or superficial type of ulcer.

Out of 150 cases, he found the right tonsil affected in 66 cases, the left in 36 cases, and both in 48 cases. In 150 cases, the ulcers in 120 were of the deep type, and in 30 of the diphtheroid type. The membrane, if removed, is found to have a very foul odor, and the same fetor

is noticeable about the breath of the patient.

Some ulcers are very acute, and may extend rapidly in surface and depth. The author has seen an ulcer increase half an inch in depth in

twenty-four hours.

The diphtheroid or superficial ulcer may cover both tonsils, the pillars of the fauces, and the soft palate, presenting an appearance very like diphtheria and frequently mistaken for it. The deep ulcer may similarly encroach on the parts of the adjoining tonsils. The urine is usually normal. In 6 cases, red blood cells were found. Renal casts were found in 1 case.

Blood. In a few cases, particularly when the temperature was raised,

there was an increase in polymorphonuclears.

Duration of the Disease. Most of the cases recover in ten or eleven days. The average duration of 150 cases was fifteen days.

Complications. The chief, and most important, is ulceration of the gums. This, as already stated, was found in every case, and the tonsils most likely becomes infected from the gums. As already mentioned, albumin, red blood cells, and tube casts have been found in the urine. Klebs-Löffler's bacillus was found coexisting in 11 cases, and syphilis in 2—both cases being corroborated by positive Wassermann reactions.

Diagnosis. In the majority of cases the diagnosis can be made with reasonable care from the clinical appearances alone, but, to be on the safe side, a direct smear should be fixed, stained with weak carbolfuchsin, or methylene blue and examined under the high power $(\frac{1}{12}th)$ for fusiform bacilli and spirochetes. The presence of coexisting diphtheria and syphilis must never be lost sight of. Slopes incubated at 37° C. for twenty-four hours are then examined for the Klebs-Löffler bacillus.

The chief clinical features of Vincent's angina are:

1. Slight constitutional disturbance. 2. Temperature rarely over 100° F.

3. Pain on swallowing.

4. Submaxillary lymphatic glands enlarged and tender.

5. Disease often unilateral.

6. The membranous exudate is usually easily removed, leaving a raw, bleeding surface.

7. Urine rarely albuminous.

8. Presence of fusiform bacilli and spirochetæ. In diphtheria we have a membranous formation accompanied by:

1. Severe constitutional symptoms. 2. Both sides of the throat affected (usually).

3. Pain on swallowing not great.

4. Submaxillary lymphatic glands not so tender.

5. Membrane difficult to remove.

6. Albumin frequently present in the urine. 7. Klebs-Löffler bacillus present in culture.

Fusiform bacilli and spirochetæ may be found in syphilitic ulcers, but the ulcer has not a clinical feature of the true Vincent's angina. The lymphatic glands are not enlarged and tender, and a Wassermann reaction of the blood will settle the question.

Treatment. It is of the greatest importance to have the teeth well attended to. He always insists on the frequent use of a mouth wash, such as peroxide of hydrogen or phenol and potassium chlorate, par-

ticularly after meals, so as to wash away all particles of food.

The author always swabs the gums daily, or twice daily, with an antiseptic. Among the other things tried have been tineture of iodine, collódial iodine, collodial silver, bacterol, flavine, and a mixture of vinum ipecacuanha 3ss, glycerine, 3i, liquor arsenicalis ad 3i, but none has given such good results as an alkaline salvarsan solution, double the strength ordinarily used for intravenous injections.

Salvarsan powder was simply dusted on the part by some; others swabbed it on mixed with glycerine. Ehrlich tried salvarsan intravenously, but Citrol, who used both the local and intravenous methods, thought the former more efficacious. Before each swabbing, the gums should be carefully dried with cotton-wool and all extraneous matter removed from between the teeth with a dentist's probe.

DISEASES OF THE ESOPHAGUS.

Cardiospasm Dilator. Larimore² describes a cardiospasm dilator which is worthy of consideration. "It was made by an ordinary stomachtube of small diameter, attaching to its end the tapering tip of a small bougie. A rubber balloon was then fastened about the tube and bougie end. About this was placed a bag made of very light-weight silk, and so cut that when the first or inner balloon was inflated, there would

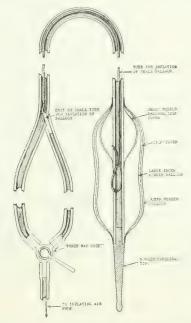


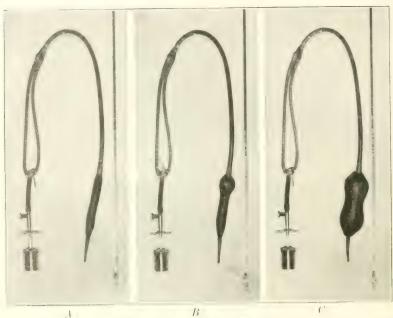
Fig. 1.—Construction of cardiospasm dilator.

appear a constriction about the middle. A second balloon was fastened over this. Air-tight fastening of the ends of the balloons was made with rubber cement and winding with small silk thread. This constitutes the dilator proper. Another small balloon may be added inside the first large balloon at its proximal end. This balloon is also covered by a silk bag which limits its degree of inflation. Its tube for inflation may extend, as is shown, through the lumen of the stomach-tube. By a three-way stopcock on the proximal end of the apparatus, either the small balloon or the large outer balloons may be inflated. The small balloon is used by inflating it primarily for locating the instrument

² Journal of the American Medical Association, December, 1917, lxix, No. 25, 2105.

definitely within the constriction. It may or may not be used, as

circumstances demand.' This is used most satisfactorily by air inflation, which is accomplished by a pump from the blood-pressure apparatus, the amount of pressure to be used is to be determined by the sensations of the patient. This author claims that a manometer is not necessary. A mandarin, furthermore, is not used, the tapered bougie end permitting ready insertion while the construction of the inflatable balloons is such as to enable the instrument to establish itself in one position without slipping upward into the esophagus or backward into the stomach. The accompanying illustrations will make clear the text.



Tro. 2. Cardiospasm dilator; A, uninflated; B, with the small inner balloon inflated; when this is introduced to the constriction, the large balloon is properly placed within the spasm; C, with the three walled dilating balloon fully inflated.

Dilatation of Esophagus. Friedenwald, Cotton and Harrison³ reported a very unusual case of diffuse dilatation of the esophagus. One hour after an Ewald test-breakfast, 520 c.c. of contents were removed, containing mucus, lactic acid, Oppler-Boas bacilli, yeast cells, starch granules and no free hydrochloric acid. The capacity of the esophageal dilatation was found to be 1700 c.c., and, at autopsy, the esophagus could be filled with 1750 c.c. of water, over twice the capacity of the stomach.

The authors considered this case to be primarily one of cardiospasm, which secondarily lead to the marked organic changes.

DISEASES OF THE STOMACH.

Hot Foods as a Factor in the Cause of Digestive Disturbances. Manquat in this article discusses the various reasons which induce him to believe that hot foods, especially hot soups, tea, etc., when taken on an empty stomach, induce digestive disturbances. Transit through the mouth is so rapid that no danger is done in that region. Nor is it likely that hot food at the close of the meal can do much harm, inasmuch as other foods in the stomach protect the organ. The thermometer will show temperatures of 60°, and even 68°, in soups and other dishes as they are taken. This is even higher in baked potato, he also points out that many of the dyspeptics who are accustomed to hot food, have long, narrow, ptosed stomachs, a certain amount of gastric tenderness, hypersecretion and constipation, indicating a tendency to chronic gastritis. He points out that even below these temperatures, the action of digestive enzymes is reduced, and there cannot help being a systemic disturbance from the action of over-heating food on an extensive and delicate mucous membrane. A correction of this habit results, according to Manquat, in the disappearance of many dyspeptic symptoms. He makes the assertion that when heat is applied, it should be applied externally.

Gastric Lipase. Hull and Ketton⁵ discuss the question of gastric They obtained the pure juice from dogs with Pawlow in whom lipase. the pylorus was ligated. The secretion was obtained in response to gastrin bodies and food. It was found that, by fasting, an acid-free juice always contains an appreciable concentration of lipase. The lipase is quite sensitive to acid and alkali, being almost completely destroyed by a fifteen-minute exposure to 6.2 per cent. hydrochloric acid. The enzyme may be recovered from the stomach showing low acid secretion by neutralizing the juice immediately from stomachs in high secretory activity: if the acid be reduced by the addition of protein, such as peptone. In a series of trials, 1 e.c. of fasting juice gave a fat-splitting of 28.2 per cent. by the Vollard method, and 22.05 per cent. by the Stade modification. The concentration of the enzyme in the gastric juice is five to six times that in the succus entericus and the blood-serum. The view that the lipase is a true gastric secretory product is discussed and favored. The probable practical importance of the lipase in stomach digestion is emphasized.

Gastric Acidity. Clinical and Experimental Observations by THE GAS CHAIN (H-ION CONCENTRATION) METHOD. McWhorter⁶ discusses some very interesting studies on the gastric contents by means of the H-ion concentration method which McClendon uses. studies were performed on fractional specimens of the gastric contents of clinical cases, and also from the material obtained from Pawlow pouches in animals. The apparatus consists of a hydrogen electrode, a calomel electrode and a potentiometer. The H-ion concentration can also be measured by colorimetric determination, comparing the unknown

Journal de Médicine de Paris, vol. xxxvi, No. 7, p. 133.
 Journal of Biological Chemistry, Baltimore, October, 1917, xxii, p. 127.
 American Journal of the Medical Sciences, May, 1918, clv, No. 5, 672.

with a known color scale. This method, however, as McWhorter points out, can prove inaccurate in the presence of varying amounts of protein and salts. The author made a number of comparisons of the titration acidity with the H-ion concentration and found that the titration method yielded uniformly higher results than the gas chain method.

A solution is acid in reaction when it contains an excess of hydrogen over hydroxyl ions, neutral when they are equal in numbers, and alkaline when the hydroxyl ions predominate. Pure distilled water dissociates into hydrogen and hydroxyl ions, the extent of the dissociation being such that in a liter of water at 22° C, there is approximately $\frac{1}{10000000}$ gram of H-ions; that is, the concentration of H-ions is $\frac{1}{100000000}$ normal (atomic weight of hydrogen as 1). The shorter way of representing so many figures is usually adopted, the logarithmic notation; thus, 100000000 H acid = 10-7 or simply pH7. Since there is one hydroxyl-ion formed for each hydrogen-ion the concentration of the hydrogen-ions must also equal pH7. The measurement of the pure gastric juice has been made by Mentenm and found to vary from pH = 0.92 1.58, being highest in the appetite juice and lowest in the secretion of the empty stomach. Michaelis and Davidsohn state that the average acidity of the stomach contents after an Ewald meal averages 0.028-0.0015; hyperacidity 0.011-0.088; hypoacidity 0.000,0041-0.000,0001.

The plotted curve of acidity of 37 cases may be divided into several phases for study: (1) The ascension, usually the first hour indicating the rapidity and intensity to a known stimulus; (2) the high point or acme, to note whether accelerated or retarded, and whether abrupt or sustained; (3) the period of descent or decline, and the possible secondary rise, also to note the character and modification of food residues. The cases observed include chronic appendix and gall-bladder cases before and after operation, hernia, carcinoma of the stomach, kidney stone, huge ovarian cyst, gastrojejunostomy, duodenal ulcer, prostatic

hypertrophy and a few remote surgical conditions.

In Group 1, 10 of 13 cases tended to a gradual rise, and at the end of the first hour had reached the maximum, from which they usually declined gradually. Three cases showed delayed rise. The average tim juice could be obtained was two and a half hours, food being absent in

the last fifteen minutes to three-quarters of an hour.

In Group 2, the curve either remains continuously high, or, after a fall, undergoes a second rise, often higher than the primary one, near or at the end of digestion. In this first subdivision were 6 cases, 2 of which showed a delayed rise; in the second subdivision were 12 cases, 1 having a delayed rise. The average time specimens could be obtained in the first division of Group 2 was two hours; in the second, two and three-quarters; in one-half of these cases food was present to the end.

In Group 3, he has placed 5 cases of hypoacidity in which the acidity was less than pH = 4. Michaelis and Davidsolm place hypoacidity between 0.00041 and 0.0000001. Considerable peptic digestion takes place at pH = 4 and a very rapid digestion at pH = 0.78 (Sorensen), so that digestion is retarded but not stopped until acidity is less than pH = 4. Dimethyl amino azobenzene does not react to an acidity less

than about a pH of 4. In one of these cases the curve of acidity later, after removal of a gall-bladder with stones, rose to a normal acidity curve. The average time specimens could be obtained in this group was two and three-quarters hours.

Hypersecretion was demonstrated in gastric ulcer cases thirty years ago (Rubow). Recently it has been found not only in inflammatory conditions of the gall-bladder, appendix and in pelvic and other organs, but in normal individuals. The vagus is considered one factor in pro-

ducing this condition.

The values of p = before operation were taken in 8 cases with chronic appendicitis and a composite curve plotted. The curve gradually rises to the end of the first one and a half hours, then falls slightly to the two-and-a-half-hour period, when it begins a secondary rise higher than the digestive rise, lasting to the end of collection. Two of these cases, having definite gastric disturbances, had early high acidity with an exaggerated secondary rise. Secretion in these chronic appendix cases was obtained for an average of two and three-quarters hours, but was obtained longer in the 2 cases with definite gastric symptoms. Food was present in 3 cases without symptoms to the end of observation, but in the others it was absent in the last three-quarters of an hour.

Emotional Influences in Gastro-intestinal Diseases. MacNevin⁷ states that: 1. The initial flow of gastric juice is psychic. It is brought about through the sight, odor, taste, or chewing and swallowing of food under normal conditions whether the food enters the stomach or is sidetracked,

as in sham feeding.

2. The flow of saliva and pancreatic secretions, and, to some extent the bile, is subject more or less to the same influences that govern the gastric secretion.

3. The flow of the digestive secretions may be modified or inhibited as a result of great disappointment, disgust, fright, anxiety, rage, or pain.

4. Fatigue or systemic infections may cause a temporary or prolonged cessation of gastro-intestinal motility.

5. In the absence of appetite or relish for food, there is a diminished activity of the secretory glands of the mouth, stomach, etc.

6. The factors influencing the digestive secretions may also modify or

inhibit temporarily the motility of the stomach.

Gastric Response to Foods. Bergeim⁸ discusses the determination and significance of intragastric conductance. This subject is one which will increase in importance as time goes on. The gastro-enterologist must realize that the simple determination of acidity by no means completes the investigation of the material removed from the stomach. In fact, the criticism of gastric analysis from a diagnostic standpoint is largely that brought about through just such work. It was to supplement these studies that in the course of work on food digestion in the stomach, it was thought desirable to make some determinations on electrolytic conductance in the gastric contents. A retention gastric tube was therefore devised and an attempt made at the Physiological Laboratorics of the

New York Medical Journal, September 18, 1917, p. 491.
 American Journal of Physiology, December, 1917, xlv, No. 1.

Jefferson Medical College to determine the significance of variations in

intragastric conductance.

The specific conductance of any solution depends only upon the number of ions present. In this way it is evident that this method is more specific than the cryoscopic index which is also influenced by molecules of undissociated substances. Strong acids and bases are very completely dissociated in solution in concentrations commonly met with in physiological solutions. Weak acids and bases are but slightly dissociated, and neutral organic substances, not salts, do not ionize. In other words, the determination of intragastric conductance may be used as an index of the concentration of hydrochloric acid in the stomach. By the method here described, this determination can be made at as frequent intervals as desired. Titration methods for free hydrochloric acid in the presence of protein are especially unsatisfactory because of the further dissociation of the protein salt during the course of analysis.

"When we study the gastric juice, we at once note that while the ash of this fluid is very low as compared with blood, bile, pancreatic juice, etc., its conductance is much higher than that of these fluids. Thus, while the specific conductance of bile at 18° C, is 130 x 10-4 reciprocal ohms (1), that of blood serum (2) about 110 x 10-4, and that of saliva about 50×10^{-4} , the conductance of pure gastric juice (3) is over 400×10^{-4} . The conductance of pure gastric juice is thus due very largely to the hydrochloric acid which it contains. The total chlorine of gastric juice is not notably higher than in blood, bile, or pancreatic juice, but the gastric secretion conducts a current much more readily than either of the other fluids because of the great mobility of the hydrogen-ion. Thus the ionic speed at 18° C, of the sodium-ion is 43.5, of the potassium-ion 64.6, of the chlorine-ion 65.5, while that of the hydrogen-ion is 318. A tenth normal solution of hydrochloric acid at 18° C, has a specific conductance of 351 x 10/4, as compared with 92.5 for sodium chloride, and 111.9 for potassium chloride.

"The cell used in this work is illus-APPARATUS AND METHOD. trated. It consists essentially of a hard rubber tip of the size used in the Rehfuss stomach-tube (about 1 cm. in diameter), slotted, however, in only one direction and made in four pieces for convenience in wiring. Into this tip are fitted, opposite to each other, the two platinum electrodes, about 10.0 x 6.0 mm. in size. All edges are, of course, rounded off smoothly so as to cause no irritation in swallowing. The leads consist of double or triple copper wire No. 36, about 3 feet long, or longer if it is desired, to pass the tube into the intestine. The conductance of the wire is appreciable and must be balanced in the other arm of the bridge. The use of heavier wire decreases the flexibility of the tube and it is desirable to maintain this. The electrodes must, of course, be properly platinized by electrolysis of platinic chloride solution and must be kept clean. The cell constant is readily determined by means of N potassium chloride solution whose specific conductance at 18° C.

is 0.01119.

"The tip, with tubes attached, is swallowed until aspiration shows it to be resting in the stomach. The conductance is determined in the

ordinary manner, using a good Wheatstone bridge, buzzer, and telephone receiver. More expensive types of apparatus are not essential for intragastric work. Two or three dry cells will furnish current. A switch convenient to the bridge is desirable so that the circuit may be kept closed as much as possible. The buzzer should be enclosed in a sound-proof box and placed at some distance from the bridge.

"The thermocouple used is a base metal couple (copper and iron constantan). Fine wire (0.1 mm.) is used for reasons previously mentioned, and also that the current through the cell may be interfered

with as little as possible.

"The couple must be coated with paraffin, and gastric juice must not be allowed to come into contact with any of the connecting wires. The couple is placed in circuit with a potentiometer indicator and high sensitivity mirror galvanometer. A similar arrangement has been used by Stengel and Hopkins in the study of intragastric temperature. By this means it is possible to observe at any moment the temperature of the stomach contents by merely adjusting the indicator until the galvanometer stands at zero and then reading off the temperature directly upon the indicator scale.

"The fact that the conductance increases about 2 per cent. for each degree rise of temperature makes accurate observations of the latter necessary. The stomach is a fairly good thermostat if given time enough to adjust itself, but, after the ingestion of cold foods or liquids of any kind, a half-hour or more may be required to reach body temperature. By the aid of the thermocouple it is possible to study the conductance in this early period after the ingestion of food with a fair degree of accuracy by applying a temperature correction. The tip may also be used simply to replace dip electrodes for determination of conductances of small amounts of fluids in test-tubes.

"In studying the significance of intragastric conductance, as determined with this apparatus, the gastric contents obtained by aspiration at fifteen-minute intervals were analyzed and values obtained compared with conductances determined at the same intervals. Total acidity was titrated, using phenolphthalein as an indicator, and free acid in most cases using Toepfer's reagent, although in a few cases the Sahli iodine method was employed. Pepsin was determined by a modified Mett method. Trypsin was determined by Spencer's method, slightly modified. The presence or absence of bile, food residues, etc., was also noted."

In studies on water and sugar solutions, any changes present would be due mainly to the hydrochloric acid present. Under these conditions the conductances of the gastric contents ran very closely parallel to the acidities. This indicates that the equalization of osmotic concentration is brought about primarily by the secretion of normal gastric juice. After the ingestion of food containing protein, the conductance curve usually lies below that for free hydrochloric acid as determined by titration, because the latter values are high due to gradual dissociation of the protein salt. In the presence of weak organic acids, such as after fruit ingestion, or phosphate, as where saliva is swallowed, the conductance values fall below the titration values, and are a much better meas-

ure of free hydrochloric acid.

Apart from the swallowing of saliva, the conductance values are very much influenced by the regurgitation of pancreatic juice, bile, or both, and to a less extent by the pyloric and duodenal secretions. The conductance value of the pancreatic juice and bile is very low compared to the gastric contents, therefore regurgitation tends to markedly lower intragastric conductance as well as acidity.

In achylias, where the intragastric digestion is mainly pancreatic in character, the conduction values parallel the pancreatic values as

measured by the tryptic index.

The Fractional Test-meal. Horner⁹ gives the results of 377 fractional test-meals, of which 139 were on proved pathologic conditions. Of the 139, the diagnosis was proved by necropsy or operation and in 74, the author states, there could be no doubt of the diagnosis. These cases he divides into six groups: (1) Diseases of the gall-bladder, 38 cases; (2) gastric ulcer, 10 cases; (3) duodenal ulcer, 26 cases; (4) gastric carcinoma, 8 cases; (5) pernicious anemia, 11 cases; (6) miscellaneous, 46 cases. Inasmuch as these results are extremely interesting, the findings are given in some detail.

Gall-bladder Disease. The fasting content varied from 2-245 c.c. with the average of 27 c.c. exclusive of the one high case. Free acid was absent in 19 cases, below 20 in 9, between 20 and 40 in 7, over 40 in 4, with an average of 14. The total acid averaged 29. Lactic acid was uniformly absent. In 17 cases mucus was excessive. A positive occult blood reaction was obtained in 3 out of 35 cases. Many pus cells were found in 1 case of cholecystitis. The fractional curve showed a gradual response, with an average total acidity of 60 and free acidity of 41. The high point averaged one hour and twenty minutes.

He says, regarding the response in gall-bladder disease: The acid values rise to the high point at which the stomach empties, the gastric cycle not being completed in 27 out of 30 cases. Bile was present in 4

cases, occurring after fairly high acid values.

The characteristic features of the fractional test-meal in gall-bladder disease are: (1) Fairly constant time for maximum acidity; (2) the emptying time of the stomach at, or near, the maximum acidity; (3) early emptying time; (4) incompleteness of the gastric cycle interrupted

by the emptying process at, or near, the maximum acidity.

From the standpoint of the reviewer, who has examined many times that number of cases, gall-bladder cases cannot be placed in one group; there are cases with and without stone, with and without infection, with and without adhesions, with and without obstruction, and, finally, with and without gastric complications or trouble with the colon. All these factors affect the gastric secretion. An old cholecystitis with infection and multiple calculi gives a different picture than a subacute infection. Pericholecystitis gives a different picture from stone in the cystic duct. In fact, the principles to be adopted are to remember that

⁹ Journal of the American Medical Association, December, 1917, lxix, 1931.

gall-bladder disease can only react on the stomach (a) through nerve reflexes, (b) infection and regurgitation through the pylorus, (c) through infection circulating and affecting gastric output, (d) through peripyloric or periduodenal adhesions from the gall-bladder. Old chronic gall-bladder cases are liable to give all the gastric phenomena of chronic gastritis.

DUODENAL ULCER. The fasting content averaged 50 c.c., the free acid averaged 26 and the total acidity 43; mucus was present in 7, acetic acid in none. Microscopically, food remnants were found only in 1 case. The author gives as characteristic (1) lack of anacid cases; (2) large amount of fasting content; (3) high acidity, the highest values being found in this group; (4) delayed emptying time with continued secretion in 6 cases; (5) frequency of pain which occurred in 8 out of 26 cases.

While the author mentions the fact that in one case the occult blood reaction was positive for blood at the apex of the curve, its appearance was followed by an abrupt fall in acidity. This appearance of blood with a fall in acidity (due to duodenal regurgitation) is, in the opinion of the reviewer, the most characteristic, and in fact the only characteristic thing of duodenal ulcer.

Gastric Ulcer. This group consisted of 10 cases, 8 of which were proved by operation, and in 2 of which the clinical diagnosis was certain. The average fasting content was 65 c.c., with an average total acidity of 51 and an average free acid of 35. The contents were colorless, with one exception. Mucus was excessive in 2 cases. Blood was negative in all.

The author gives as a characteristic in gastric ulcer: (1) The amount of the fasting content is relatively large; (2) the response is weakened and delayed; (3) a high point of only moderate acidity is attained; (4) free blood and pain during the test are unusual; (5) the emptying time is fairly uniform, at $2\frac{1}{4}$ hours.

Gastric Carcinoma. Eight cases were studied, and his conclusions are as follows: In gastric cancer (1) there are two types of curves, an acid and hyperacid; (2) in the anacid cases the stomach empties early, with one exception, which is associated with a edematous pylorus; (3) there was a continued secretion in 2 cases in which there was free acid; (4) in all 3 hyperacid cases the cancer was at the cardia or lesser curvature, the pylorus being free.

Pernicious Anemia. In the study of 11 cases of pernicious anemia, the following conditions were observed: (1) A small amount of fasting stomach contents; (2) complete anacidity; (3) absence of blood; (4) unchanged food; (5) early emptying time; (6) the presence of free acid in severe secondary anemias of known etiology simulating true pernicious anemia.

His conclusions are as follows: 1. The fractional test-meal satisfies the clinician as to the amount and character of the fasting stomach-content, the gastric response, the acidity, the amount and character of the secretion, the degree of gastric digestion, the presence of blood, the amount of bile, and the pain at any specific point in the gastric cycle, which is of considerable diagnostic value.

2. Certain fairly constant characteristics of the curve are noted in various diseases. In gall-bladder disease the secretory response is prompt, with high acidity, and the emptying time occurs at, or near the high point. In duodenal ulcer there is a prompt gastric response, high acidity and delayed emptying time. In gastric ulcer not effecting the pylorus, there is considerable weak and delayed response, moderate acidity and early emptying time. Gastric carcinoma presents two types of curve, the first showing the presence of acid and a delayed emptying time, and the second showing the absence of acid and an early emptying time. Pernicious anemia shows an anacid curve and an early emptying time, while severe secondary anemia shows a definite secretory response and a delayed emptying time. Chronic focal infections may show anacid curves suggesting the gastro-intestinal tract as a possible atrium of infection.

Crohn and Reiss, 10 in a report at the meeting of the section on Medicine of the New York Academy of Medicine, discuss the Fractional analysis of Gastric digestion. From a study of 200 curves they give their findings. They used the Rehfuss tube, and examined both the fasting and the digesting stomach. They believe that, except in cases where gastro-enterostomy has been performed, there appeared to be no clinical significance to the presence of bile in the fasting contents. The total residuum averaged generally lower than that of Rehfuss, Fowler, and Zentmire.

They found, for instance, in gastric neuroses, 2-60 c.c., averaging 31 c.c.; gastric or duodenal ulcer, 20-140 c.c., averaging 54 c.c.; chronic appendicitis, average 31 c.c.; subacidity or achylia cases were either empty or showed a maximum of from 10 25 c.c., in functional hypersecretion 50 70 c.c. The acidity of the fasting stomach varied considerably, but, in general, followed the acidity of the digesting meal. It was never above the maximum acidity, usually lower. This might be designated as the minimal acidity of the stomach. They used a heavy oatmeal gruel as a test-meal. This was prepared by adding two table-spoonfuls of oatmeal to a quart of water and boiling it down until it had reached a pint in volume, filtering, and adding a pinch of salt. Since achylia gastrica belongs merely to an advanced stage of anacidity, those cases belong properly to the class of anacidity, rather than to create a new class of "spurious achylia" (Rehfuss).

These authors give, as somewhat characteristic of ulcer, the steady, rapid, prolonged rise, and sustained plateau of acidity, but, further on, state that they know no way in which the acidity curves of cholelithiasis and appendicitis could be distinguished from those of ulcer. Posterior gastro-enterostomy cases showed normal or subnormal curves with a marked drop in one hour, while the curves of gastric carcinoma showed marked subacidity, even achylia, coupled with the other phenomena of cancer. Gastric ferments were retained in all these cases. Chronic parenchymatous nephritis, the convalescent stage of intercurrent infections, and syphilis of the stomach, gave a curve of subacidity without

novel characteristics. In the field of digestive or postdigestive hypersecretion, the method is unexcelled, and the authors state that "the field of usefulness of this method for the study of defects of medication, dietary, therapy, psychical influences, and operative procedures was unlimited." It is difficult, in the short space of time, to discuss these facts, nor is the purpose of this review an exposition of the reviewer's opinions. However, in justice to this subject, the question of fractional analysis is far more complicated than appears from this resumé. Its possibilities have been only superficially investigated, the primary mistake being largely the fact that most clinicians consider only the acidity.

The Balanced Diet Analyzed. In the abstract on balanced diet, Rose¹¹

classifies foods as follows:

Proteins: Meats (including chicken and fish), eggs, milk and cheese. Fats: Butter, cream, olive oil, and bacon.

The carbohydrates are divided into two groups:

High content	· Per cent. of	Low content carbohydrates.			Per cent. of sugar and starch.
carbohydrates.	sugar and starch.	_			22.0
Sugar	. 100	Bananas		٠	. 22.0
Honey	80	Apples			
Cereals	80	Pears			
Dried figs, dates, raisin	s . 76	Peas			
Crackers	71	Lima beans			. 14.0
Jelly	17	Parsnips .			. 13.0
Sponge cake	65	Oranges .			. 11.0
Bread, all kinds	50	Squash			. 10.0
Apple sauce	34	Peaches .			. 10.0
Puddings	29	Gooseberries			. 10.0
Ice cream	27	Carrots .			. 8.0
Potato	0.1	Beets			. 7.4
Almonds	. 23	Strawberries			. 7.0
Custard	. 22	Cabbage .			. 5.0
Corn (canned)	18	0 .			. 5.0
Cereals (moist)	17	Celery			. 3.3
Macaroni	1.0	Lettuce .			. 3.0
Soup thickened .	10	Spinach .			. 2.0
boup unekened .	10	Asparagus .			. 2.2
		String beans			. 1.9
		Clear soups			. 1.1
		Cicar soups			

SAMPLE MAINTENANCE DIET.

		Grams	Gracarbohy	Calories.	
	protein.	fat.	High.	Low.	
Breakfast.					
Fats: Butter, 1 ball, $\frac{1}{2}$ ounce		8.5			80
Cream, thin, 4 tablespoonfuls	2.0	12.0		2.0	120
Subtotals, fats		20.5	20		100
High content, carbohydrates, cereals Bread, 2 slices, 4 x 4 x 2 inches	$\frac{2.5}{4.6}$	1.0	26		140
Sugar, 2 teaspoonfuls			16		66
Subtotal high content, carbohydrates Low content, carbohydrates, orange	1.0		62	15.0	70
Coffee	1.0		No val		
Subtotal, protein, fats, etc., acquired incidentally	10.0	1.0		2.0	
Breakfast, total	10.1	21.5	62	17.0	576

SAMPLE MAINTENANCE I	JIEI C	oneene		ams	
	Grams	Grams		ydrates.	Calories.
	protein.	fat.	High.	Low.	Carorico
Luncheon.					
Proteins:					
Eggs (2)	13.0 13.0	10.0		1	
Olive oil (2 teaspoonfuls)		8.0			74
Butter (1 ball)		8.5			80
Subtotals fats		16.5			
High content, carbohydrates:	4 0	1.0	0.0		1.40
Bread (2 slices)	4.6	1.0	26		140 50
Macaroni (2 tablespoonfuls)	2.0	1.0	8		65
Sugar (2 teaspoonfuls)	1		50		00
Subtotal high content, carbohydrates			30		
Low content, carbohydrates:	1.0			2.8	18
Lettuce, head	1.0			17.0	75
Subtotal, low content carbohydrates .			1	19.8	
Subtotal, proteins, fats, etc., acquired inci-					
dentally	8.6	12.0			
			W.O.	10.0	000
Luncheon, total	21.6	28.5	50	19.8	663
DINNER.			1		
Proteins:	34.5	27.0	1		450
Meats, 3 to 10 pounds, $5 \times 3 \times \frac{3}{4}$ inches	34.5	21.0			100
Subtotal proteins	01.0		1		
Butter, ½ hall		4.2			40
Cream, 2 tablespoonfuls	1.0			1.0	60
Subtotal fats		10.2	5		
High content, carbohydrates:					1
Soups thickened	5.5		24		160
Bread (1 slice)	2.3		13		70
Potato (medium size)	2.0		20		80
Sugar (1 teaspoonful)			8 65	1	33
Subtotal high content, carbohydrate			00		
Low content carbohydrates: Squash (2 tablespoonfuls)	1.0			7.0	40
Squash (2 tablespoonfuls)	5.0			10.0	
Apple (1)	0.5			17.0	
Apple (1)				34.0	
Subtotal fat, etc., acquired incidentally	17.3			1.0	
The state of the s					
Dinner, total	51.8	44.7	5 65	35.0	1098
Days, total, protein, fats, etc., acquired, inci-					
dentally	36.0	47.5		3.0	
Days, total protein, fats, etc., acquired, inten-					
tionally	4 77 17	47.2	5 177	68.8	
Total for the day	83.5	94.7	5. 177	71.8	2337

The Effects of Antacids in the Stomach. Crohn¹² ¹³ in an admirable study on the effects of various antacids reaches conclusions which are extremely important. By means of the fractional examination of the gastric contents, he traced out the effects of sodium bicarbonate, mag-

18 Ibid.

¹² American Journal of the Medical Sciences, June, 1918, No. 6, clv, 801.

nesium oxide, the salts of bismuth, olive oil, and atropine. In other words, he was able to plot out exactly, by this method, the effect of each of these substances. (Some time ago, from the Reviewer's laboratory, there was a contribution in the American Journal of Physiology which pointed out these things, although no mention was made of it in the author's article.) After a preliminary discussion of the uncertain state of the literature regarding the effects of the antacids, and the lack of knowledge regarding their exact effects, Crohn describes a series of experiments on individuals suffering from mild functional disturbances in which he tried the effects of these various substances. Briefly reviewed, the results were as follows:

Magnesium oxide in 1-gram doses before the test-meal converted a mild hyperchlorhydria into one which was more persistent and more

constant, while the evacuation time was delayed.

Bicarbonate of soda during digestion in 2-gram (30 grain) doses produced a primary fall and a secondary rise, the secondary augmentation remaining through the entire period of digestion. Twice that quantity (4 grams) only served to accentuate the evanescent effect of soda.

These experiments accord exactly with the results which we¹⁴ pointed out some time ago. We showed that the primary rise was always followed by secondary stimulation, often more pronounced than before. These curves are readily seen in the above article. Magnesium oxide as a more slowly acting antacid was then studied during digestion, 0.3 gram (4.5 grains) directly after eating caused only a negligible fall in acidity; doubling the dose decreased the acidity but the maximum acidity was increased and the motility slightly delayed. In a third patient the dose was tripled (12 grains), and the fall of acidity was less rapid, but more prolonged, but rose later to a figure exceeding that of the control. In other words, it was evident, as Crohn points out, that the gain by initial neutralization was more than compensated for by the subsequent increase in acidity. The effect of alkali at the end of a meal: 12 grains of magnesium oxide given at the end of a meal produced a rapid and efficient neutralization of digestive acidity without secondary rise. Bismuth subcarbonate, in 2-gram doses after the meal, produced a reduction in acidity without a corresponding compensatory rise. In other words, it was apparent that the neutralizing effect of bismuth was efficient, moderate, and prolonged, without deleterious after-results. Kaolin failed to register any action.

Atropine. Atropine by mouth was practically without effect; hypodermically, however, in cases of hypersecretion it was observed to have a direct effect. In the discussion of these results, it was evident that both magnesia and soda produce a primary neutralization followed by a secondary rise, which, in the case of magnesia and also, but less frequently, with the soda, exceeds the previous level. The custom of giving alkalies before meals is, as Crohn points out, definitely wrong. In other words, the stimulating effect of these substances comes just at the digestion time, so that the acidity is reinforced rather than diminished.

¹⁴ Spencer, Meyer, Rehfuss, and Hawk: American Journal of Physiology.

The disadvantages of a large dose of magnesia, 15 grains or more, are: (1) That the initial depression is excessive, robbing the stomach of its essential free acid for a period varying from half an hour to two hours; during this period proteolysis is paralyzed, since free acid is essential to the digestion of proteid. (2) The subsequent reaction on the part of the acid-secretory cells is so vigorous that the therapeutic purpose is defeated. The dose of magnesia should therefore be a moderate one, 8 to 15 grains, depending on the degree of hyperchlorhydria one wishes to produce. Doses in excess of this tend to emphasize the disadvantages incident to the use of the drug. It should never be forgotten that the neutralizing power of the magnesia radical is three and one-half to four times as strong as that of the soda radical. The same rules that apply to magnesium oxide apply in general to magnesium carbonate, ammoniomagnesium phosphate, the soluble magnesium hydrate, and other magnesium preparations.

The exhibition of magnesium salts at the end of digestion effectually

diminishes acidity and has a prolonged action.

The method of administering fractional doses of magnesia at intervals during digestion has proved to be the most practical manner of employing such a salt for the correction of hyperchlorhydria. Five grains of magnesia every half-hour is an excellent antacid for this purpose. The success of the fractional method of administering alkalies confirms the opinion of Bourget, who suggested a saline alkaline mixture to be sipped at frequent intervals after a meal. He proposed the following formula: R. Sodii bicarb. purif., 8; sodii phosphatis ex sic., 4; sodii sulphatis ex sic., 2. Misce, fiat pulv. dent. tal. dos. Mr. x. Sig.—One powder dissolved in 1 liter of cold water.

The action of bismuth as an antacid is a highly satisfactory one. The neutralization of the acid is deliberate, moderate and prolonged, and a secondary rise of acidity is avoided. Bismuth subcarbonate has only 36 per cent. of the neutralizing power of an equal quantity by weight of sodium bicarbonate. The breaking down of bismuth subcarbonate to bismuth oxychloride takes place slowly, and it is probably because of the slow decomposition that a secondary acid reaction is prevented.

The action of olive oil was disappointing in that it rarely diminished the acid titer of the gastric contents. Good results were seen only in cases of pure hypersecretion. The same disappointment applies to atropine given by mouth, even in a single dose or in successive doses during the day. On the other hand, the efficacy of atropine administered hypodermically in cases of hypersecretion accompanying hyperacidity was quite evident. In these cases the acidity was dininished, and, in addition, the secretion of the gastric tubules was markedly inhibited.

The combination of a more slowly-acting antacid, such as bismuth, with the more rapid and vigorous salts of magnesia or soda, is justified by the foregoing experiments. The antacid effect of the bismuth was observable throughout the secondary hyperacid stage produced by the

¹⁵ Journal of the American Medical Association, June, 1918, No. 6, clv, p. 817.

more readily dissociable elements. As regards dosage, the same rules apply to drugs in combination as when they are singly administered. The dose should be a moderate one in both instances.

It becomes apparent, from a closer study of these charts, that delay in gastric motility occurs as part of the action of the antacid salts. When moderate doses were used, a partial neutralization of the free acidity tended to "slow down" the rate of activity of the gastric ferments. When larger doses were used, paralysis of the proteolytic ferment (pepsin) was brought about and proteid digestion temporarily ceased. This, in itself, is a plausible explanation of the delay of motility. Basing one's judgment on the theory of the acid control of the pylorus, as propounded by Cannon, one would be led to believe that the diminution of acidity would encourage a patulous pylorus and a more rapid emptying time. But the secondary rise in acid acts in a contrary manner to control and to delay this premature evacuation; the rising acidity toward the end of digestion in place of the customary declining acid values naturally tends to inhibit the emptying of the viscus. However, the delay was rarely prolonged and did not become at any time a considerable factor.

The natural secretion of mucus in the stomach is not apparently

affected by the administration of the antacid medicaments.

The regurgitation of bile and duodenal juice, an occurrence which normally takes place in a large proportion of cases, varies only in a manner to parallel the fluctuations in acidity. This regurgitation is not a constant factor and may take place coincidently with a high acidity, as well as with a moderate subacidity. The favorite time for the reflux flow of duodenal contents is toward the latter half of digestion, that is, during the period of declining acidity. After the administration of magnesia or bicarbonate, the secondary rise of acid may check this regurgitation of intestinal fluid. Whether this has at the present time any

importance or significance, it is impossible to state.

In conclusion, it seems to me that these points should occupy the attention of every thoughtful gastro-enterologist. In this day and generation, when the practice is to load every poor gastro-intestinal case with alkalies, it becomes necessary to change our opinions regarding their effects. We see from these studies, and from my own studies on this subject, most clearly that no definite purpose is achieved by temporary neutralization. In fact, when we add to the deleterious effects not merely a distortion of the entire digestive curve, but also a delay in motility, it only serves to complicate the case. In other words, we are gradually working around to the fact that, even in the treatment of such conditions as ulcer of the stomach, by the method of Yarotscky, and others, a pure dietary curve is to be preferred to the use of irritating antacids. In fact, there are some men like Smithies, of Chicago, who treat ulcer without antacids.

Gastric Muscle Activity. In a consideration of diseases of the stomach, the questions which occupy the mind of the observer have been more largely those dealing with physiological problems. These new studies, embracing as they do muscular contraction (balloon method of Carlson), cryoscopic index (Meunier), fractional analysis, intragastric conductance, and new studies on the x-rays, have pointed the way for the solution of many of the pathological problems today. We examine not merely the acidity of the gastric contents as well as the presence of pus, blood, mucus and bacteria, but we determine the tryptic index for evidence of regurgitation, the albumin content for evidences of the exudation of pathological protein, the amino-acid content for neoplasm, and regurgitation, electric conductivity for the hydrogen-ion concentration, and recent studies demonstrate the practicability of bacteriological examination.

The question of habitus in connection with the form and size of the stomach is an important one and the studies of Mills with the x-rays emphasize the importance of habitus on the question of gastric evacuation. Whether we are to believe the original dictum of Holzknecht, that it makes no difference what the form of the stomach is as long as it does its work, is a question not yet satisfactorily solved. Gray¹⁶ studied the postural activity of the gastric muscle. The normal stomach adapts its size to the volume of its contents with only slight changes in intragastric pressure. As the change in volume increases, the extent of postural activity decreases. The mechanism producing this is found solely in the gastric muscle and not in the external nervous mechanism. Pilocarpine, atropine, and epinephrin only have an indirect influence on postural activity. They neither increase nor decrease gastric tonus. but they act on the extrinsic nerves.

Reduction of Gastric Acidity. Jacobson¹⁷ proceeds on the principle that the treatment of hyperacidity should be the reduction of the element chlorine and not necessarily the element sodium. In fact, he points out that various investigators have shown that a reduction of salt was almost as bad as starvation, and that the real difficulty in attempting a strict dietary has been that most investigators obtained a

diet in which the inorganic salts generally were reduced.

He proposes to rid the system of chlorine by giving plenty of potassium salts (Bunge) avoiding the use of sodium bicarbonate which hinders elimination (Goldberg and Herz) by frequent aspiration. The method of attack is to use a well-balanced diet simply lacking in the element chlorine. To season his food, the patient should have a special inorganic mixture of the same proportions as that found by Bosworth and Van Slyke, except that calcium lactate is substituted for calcium chloride. As these salts are also acceptable to patients who are on a salt-free diet for nephritis, in place of seasoning with common salt, the following formula is given:

		-									
Dicalcium phosphat	е.									5.8 g	rams
Monomagnesium ph	iosph	ate								3.4	6.6
Dipotassium phosph	ate							٠		7.7	46
Potassium citrate				٠	٠			۰	•	1.7	66
Sodium citrate .				٠						6 . 'E	
Calcium lactate .			٠				٠	۰		4.0	
Mix and pulverize.											

American Journal of Physiology, February, 1918, xlv, No. 3.
 Journal of the American Medical Association, November 24, 1917, No. 21, lxix, 1767.

The important articles of diet are fresh meat, potatoes, carrots, cauliflower cut fine and then boiled for hours with several changes of water; stewed apples, prunes, and apricots; very weak tea and coffee; butter freed from salt by washing small portions thoroughly in running water; one egg, and about 50 c.c. of cream or milk per day, but no more. Distilled water is used for drinking, but, if need be, tap water is used for cooking if the chlorine content is low, as in Chicago.

A sample dietary for the day is as follows: Breakfast: Oatmeal gruel with a little sugar and cream; apple sauce; very weak coffee, with sugar

and cream.

Dinner: Fresh meat boiled and hashed; potatoes boiled and mashed; carrots likewise; special salt-free butter; orange juice diluted and sweetened.

Supper: One egg, raw, boiled or poached; boiled rice, purée of prunes;

very weak tea, with sugar and cream.

(The Reviewer does not believe that this will reach the question of hyperacidity any more than any of the other distorted diets, when it has been demonstrated that the cause of the symptom "hyperacidity" is to be found in something else besides the titratible acidity of the gastric juice.)

Action of Opium on the Digestive Tract. ACTION ON THE STOMACH.
Macht¹⁸ states that, in addition to the nauseating and, what is always an accompaniment of emesis, the salivating action of morphine, several other effects produced by that alkaloid and by opium on the stomach must be mentioned.

The absorption from the stomach, in so far as it takes place, does not

seem to be interfered with by these drugs.

The secretions of the stomach wall are, however, markedly decreased. The drug, after having been absorbed from the intestines, is excreted by the gastric mucosa. Indeed, even after hypodermic administration of morphine, a considerable percentage of it is excreted into the stomach and can be recovered by washing it out. This is of practical importance and suggests lavage as a rational procedure in all cases of opium or morphine poisoning.

Perhaps the most striking effect of morphine on the stomach is a powerful tonic contraction of the pylorus which lasts for many hours, as may be demonstrated by roentgen-ray studies. This pylorospasm is regarded by Magnus¹⁹ as one of the principal factors tending to produce constipation after morphine. Opium, or the total opium alkaloids, do

not produce such a powerful spasm of the pylorus.

The decrease in secretion and the pylorospasm are in large measure responsible for the indigestion following the administration of

morphine.

Finally, we may mention the remarkable anorexia produced by morphine and opium. It is well known that morphine fiends and opium eaters can go for long periods of time without food, owing to the impair-

¹⁹ Pflüger's Arch., 1918, cxxii.

¹⁸ American Journal of the Medical Sciences, No. 549, vol. cliv, p. 877.

ment of digestion and loss of appetite consequent to the taking of the

drugs.

ACTION ON THE INTESTINES. In respect to their action on the intestine important differences are to be noted between morphine and opium. In order to understand these it is necessary to examine somewhat in detail the action of morphine on the one hand, and of the so-called "minor" opium alkaloids on the other.

When the action of morphine is studied on a segment, or a loop, of isolated intestine, it is found that it powerfully stimulates the isolated peristalic movements and decreases the tonus through an action on Auerbach and Meissner plexuses situated in its walls. A similar effect is produced by the other alkaloids of opium which belong to the pyri-

dinphenanthrene group, namely, codeine and theabine.

The sedative or constipating action of morphine, when it occurs, is due to a number of other effects produced by it, and which counter the above-described stimulating action. Of these, the most important are as follows: (1) A spastic contracture of the pylorus, already described above. This hinders the passage of food from the stomach into the gut, and in this way deprives the latter of one of its natural stimuli. Magnus, in a very elaborate study, regards this as one of the chief causes of constipation after morphine. (2) There is a similar tonic contraction of the ileocecal sphincter which tends further to hinder the passage of fecal matter. (3) There is a diminution in the pancreatic and enteric secretion which also tends to produce constipation. (4) It is interesting to note that although the secretions are inhibited, the absorptive power of the intestine is unimpaired. This circumstance, together with the fact that the intestinal contents are propelled more sluggishly, leads to even more complete absorption of fluid and the production of harder feces. (5) According to Nothnagel,20 Spitzer,21 and others, morphine causes an increased tone of the splanchnic nerve centers, and hence a greater inhibition of the intestinal movements. (6) It is claimed by some authors22 that morphine tends to benumb, or paralyze, the sensory nerve-endings in the intestinal walls and thus render it still less responsive to stimuli.

It is thus seen that while the action of morphine on the Auerbach and Meissner plexuses tends to stimulate the intestinal contraction, some of its other effects tend to counteract this stimulation and inhibit the contraction, and still other effects, by producing changes in the consistency of the feces, tend still further to lead to constipation. The final effect is a resultant of all the factors above mentioned and depends on which of them have the predominating influence. This varies in different animals. Thus, in cats and dogs, morphine ordinarily produces purgation. In man the result may be constipation, but very often the peripheral stimulating action is sufficient to prevent it. Again it is well known that morphine habitués suffer alternately from obstinate constipation

and frightful diarrhea.

Virchows Arch., 1882, lxxxix.
 Jacobi: Arch. f. exp. Path. u. Pharmakol, 1891, xxix, 171. Pohl: Ibid., 1894, xxxiv, 86.

Changes Produced in the Gastric Secretion by Fever. Meyer, Cohen, and Carlson²³ tested the effect of fever on gastric secretion by experimentally inducing a temperature of 105° F. to 112° F. by injections of sodium nucleate and the bacillus prodigiosus, and in a second series by external heat. They tested the amount of secretion which appeared in response to the injection of 1 c.c. of gastrin. In all, the volume was diminished, and in some cases there was no secretion at all. The chlorides were practically constant. These authors therefore believe that this action is exactly the same as that seen in the response of the stomach to food in fever, namely, that there is a general cessation of secretion due to the elaboration of toxins which have a depressive action on the gastric cells.

This finding is in accord with certain clinical studies of mine, and would indicate, from a clinical standpoint, that all food should be predigested or especially prepared in febrile conditions. With the differential capsule, we were able to demonstrate in several cases of pneumonia as well as in typhoid fever, a color reaction which was certainly less than that seen in health. This subject is worthy of much more complete

study.

Gastric Study. McCaskey²⁴ discusses a bariumized meal with combined chemical and fluoroscopic study as a means of rapid stomach diagnosis. In spite of the fact that certain details, such as suspected pyloric diseases, filling and budding defects, etc., can perhaps be better made out by radiographs, the fact remains that for the majority of x-ray diagnosis of the digestive viscera, the filling of the stomach, and the peristaltic phenomena, can better be made out by means of fluoroscopic examination. He therefore combined in a meal substances which were opaque and yet, for test-meal purposes, failed to interfere with the secretory work of the stomach. The latter point he studied by adding barium to test extracts of known acidity. According to this author, the addition of barium failed to change the acidity. Furthermore, while the barium can be filtered off so as not to interfere with the titration of acidity, nevertheless it offered no obstacle to correct titration. He found, however, that considerable barium, one to two ounces, inhibited the secretion, and therefore changed the technic in such a way as to obviate this effect.

The patient is placed behind a fluoroscopic screen, and given two ounces of water with a third of an ounce of barium to drink, as suggested by Case. The behavior of the barium can then be studied and the effect of the various tonicities recognized. Before removing the patient from the screen, a test-meal is given composed of one and one-half ounces of cream of wheat boiled in sufficient water to measure ten ounces when cooked. The movement of the barium which will be in the pyloric antrum will show the amount of depression from the weight of the test-meal, which gives some information regarding the mobility and tonicity of the stomach and its supports. At the same time, a fractional tube can be inserted, and the progress of gastric chemistry watched at definite intervals. The author furthermore points out the fact that the test for occult blood is not interfered with, while the delicacy of Uffelmann's

Archiv. Internal Medicine, March, 1918, No. 3, p. 354.
 Trans. Amer. Gastro-Enterol. Assn., 1917, p. 25.

reaction for lactic acid is reduced about one-half. In the discussion of this paper, Meltzer mentioned the fact that barium is known to increase gastric peristalsis, a fact which in the minds of some observers has militated against its use.

Dilatation of the Stomach from Atony. Timbal²⁵ claims that hypersecretion is not necessarily a sign of ulceration. It may be the consequence merely of atonic dilatation. The resulting motor disturbances and stagnation of the stomach contents irritate the walls, with a secondary Reichmann's syndrome. Contrary to the hypersecretion with ulcer. with dilatation the hypersecretion is not mixed with lactic acid, certainly not at first. These patients become thin and nervous, and the primary fault to be remedied is the atony. As they become better nourished, the tendency to atony and also to hypersecretion disappears.

In my opinion, this whole question of hypersecretion needs to be modified; a large proportion of normal individuals, fully 40 per cent., show a continued secretion after the normal digestion period, and there is a certain group in which there is a marked tendency on slight provocation to both atonic manifestations and hypersecretion. The atony is not the cause of hypersecretion, but both are secondary manifestations in that the same underlying cause is responsible for both. In fact, in many of these cases, there is present an unstable autonomic system which has been irritated by various things; alcohol, tobacco, excessive meals, indiscretions in living and diet. Correction of these factors, and recognition of the type, are the keynotes in successful treatment.

Reverse Peristalsis. Alvarez²⁶ discusses, in a most interesting article, the syndrome of mild reverse peristalsis. This subject is one of the most important which the internist is called upon to see. One thing is clear, that all studies on digestion tend to demonstrate that, apart from purely obstructive disturbance, all disease tends to affect the digestive tract either through the secretions or through the motor function. Studies are now being carried on to ascertain the exact significance of disturb-

ance of each of these functions.

As Alvarez points out, there are four types of motor disturbance: (a) Speeding up of the current; (b) slowing of the current; (c) complete stoppage; (d) reversal of the current. It is this last named condition which has received little notice but which, in my opinion, is of the greatest importance. Reverse peristalsis is normal in the right half of the colon, and undoubtedly occurs in the upper alimentary tract where duodenal regurgitation is unquestionably a normal mechanism in the control of acidity. A great deal is known of fecal vomiting which is the severe form of reverse peristalsis, but its significance in the commoner forms of gastro-intestinal symptoms, such as vomiting, regurgitation, heartburn, belching, nausea, biliousness, coated tongue, is less readily understood. Less important, and more doubtful, are globus, foul breath. and the feeling of fulness immediately after the beginning of a meal.

To properly appreciate the meaning of this mechanism, it is to be recalled that the digestive tract is a muscular tube in which material

²⁵ Archiv, des mal, de l'App. Dig., Paris, March, 1918, p. 481.

²⁶ Journal of the American Medical Association, December 15, 1917, p. 2018.

moves from regions of high tone, high rhythmicity and high irritability to regions of lower tone, lower rhythmicity and lower irritability. The presence of food or an irritating lesion in any part of the tract tends to raise the tone and irritability of that point, and, in this way, the normal gradient may be upset. At that time the gradient, as the author calls it, may perhaps become levelled. In a number of cases of duodenal ulcer, for instance, the author noticed contraction-waves appearing in various parts of the stomach and dying out, unable to advance in the direction of the ulcer. A still commoner finding with duodenal ulcer and chronic appendicitis is a stomach which fails to empty itself after six hours in spite of active peristalsis.

Alvarez, in a previous communication, was able to show that the aboral progress of waves over the stomach is due, at least in part, to the fact that the latent period of the muscles around the cardia is less than that of the muscle in the pyloric antrum. The muscle of the cardia is very sensitive to trauma or to adverse conditions, while in the antrum this is not so pronounced. This makes it possible that in disease the gradient of latent period is actually reversed. Alterations in this tonicity and irritability can occur in the same person at different times. In fact, it is probable, according to the author, that the "dyspeptic" who goes on a vacation probably develops a steeper gradient; "rough food" will then be carried along without "hanging up" anywhere; his digestion will perform and his bowels move normally.

Vomiting is typically a manifestation of reverse peristalsis and is often due to increased irritability of the small bowel above that of the stomach. In fact, the author even attempts to explain the vomiting of pregnancy not on a toxemic basis but because, in his belief, the uterus in some way influences and raises tone, irritability and activity of the lower part of the bowel, so that there is a tendency toward reverse peristalsis. This was recognized by Campbell who suggested that we utilize the reverse action of the bowel in giving nutrient enemas in this

condition.

Vomiting shades off into regurgitation in many cases. In fact, certain people will often taste certain foods all day long; particularly fats which have a tendency to regurgitate from the bowel into the stomach. Often in duodenal ulcer, gall-bladder disease, or chronic appendicitis, there will be regurgitation of bile-stained fluid before breakfast. Some women will often regurgitate just before the menstrual period. The distention of the pelvic colon may have been keeping that portion of the bowel overactive and induced reverse waves. In this way a full and overactive bowel or an irritable ileocecal region in appendicitis will cause waves to run up the bowel and show themselves in the stomach and esophagus as waves of acid regurgitation. The author discusses this symptom in detail, and with many of his views the reviewer is in entire accord. Little enough attention has been paid to these symptoms by the profession at large.

In this article the conflicting opinions are given, for instance that of the prevalent notion that heartburn was due to the regurgitation of acid secretion, and the opinions of Hurst, Lowenthal, and Schur that, even in

individuals with ulcer, they could not feel the acid any more than normal persons can. In fact, we all realize that this troublesome symptom occurs in many people who have actual subacidity, and I have seen it in demonstrable achylia, so that it must have some other basis than a mere question of increased titratable acidity. Reichmann many years ago demonstrated, however, that at the junction of the middle and lower thirds of the esophagus, the secretion was alkaline in normal individuals and acid in those with heartburn, but its association with belching and regurgitation stamp it as due to reverse peristalsis. The reason why regurgitation is accompanied by the passage of fresh tasting food in the mouth in certain cases, and in others by acid material, Alvarez explains by the fact that, when the food is fresh, the material regurgitated comes from the top of the fundus, and, when it is acid, it is due to the regurgitation of burning liquid from the antrum or even the duodenum along the "trough" or gastric canal.

Belching is likewise placed in the class of reverse peristalsis and with reason. Whether it be simply a gurgling in the esophagus, or an involuntary regurgitation of gas from the stomach, or voluntary swallowing and true aerophagia, the result is the same. They all come from reverse peristalsis, and, apart from heightened irritability of the vagus, the explanation is to be found in some point of heightened irritability along the gastro-intestinal tract, such as ulcer, gall-bladder disease or chronic

appendicitis.

Nausea is another symptom of interest undoubtedly accompanied by reverse peristalsis. The author's impression is that it is most commonly associated with lower bowel lesions and with extreme rarity by lesions of the cardia and esophagus. It is acute in appendicitis, lower bowel inflammations and obstructions. He has seen it as the only evidence of carcinoma of the pelvic colon. An interesting observation is the following: "The nausea and vomiting caused by disgusting impressions, by rolling movements, as at sea, and by cerebral disease might conceivably be due to a reversal of the gradient in the gastro-intestinal tract brought about by unequal or dissimilar action of the vagus on different parts of the stomach and bowel."

The explanation of coated tongue likewise belongs to the category of mild reversed peristalsis. The experiments of Kast of giving lycopodium powder in sealed capsules to a number of persons, and the ability to recover most of it in the mouths of these persons the next morning is convincing. Even more so are the experiments of Grutzner who gave lycopodium spores in enemas and was able to recover them from the stomach. Globus and the sensation of fulness are explained in the same way. In biliousness, the relief induced by a laxative occurs not so much from the clearing out of toxins as from the removal of material obstructing and irritating the colon and altering its irritability.

In conclusion, the author states, in this highly interesting communication, that vomiting is often due to reverse peristalsis in the intestine; regurgitation is a mild form of vomiting; heartburn is due to regurgitation; nausca is probably one of the ways in which we perceive reverse

peristalsis; "biliousness" is a common name for the reverse peristalsis syndrome; a "coated tongue" and "foul breath" are often the results of regurgitation; globus is due to reverse waves in the esophagus, and the feeling of fullness after eating a few mouthfuls is often due to back

pressure in the intestine.

This paper is full of thought, it establishes the necessity for a more thorough knowledge of the causation and the realization of the common origin of symptoms seen in many diverse conditions. The mechanism by which they are brought about seems clear; less clear is the method by which the irritability in the nerves controlling these muscles occurs, whether through soluble chemical or bacterial toxins, psychic agencies, etc.

The Principal Syndromes of Dyspepsia. Ramond²⁷ discusses in a general way the main syndromes attending digestive disturbances, and divides them into four types: (1) Vasomotor type, (2) cyclic type, (3) inverse

type, (4) mixed type.

1. Vasomotor Type. The meal, almost immediately after ingestion, is followed by gastric distention and discomfort. This usually occurs after the evening meal, but may accompany all of them. This distention is often subjective only, but in many instances is real and evident on examination. With it go a series of vasomotor symptoms—congestion of the face, tendency to somnolence, coldness of the extremities, heaviness of the head, and often headache, occasionally vertigo with or without buzzing of the ears, dilated pupils, a tendency to general fatigue, tachycardia, etc. These symptoms lessen in a few hours either spontaneously or after sleep. Objective examination is usually negative. These cases are not true gastric cases; nearly always the trouble is found in the autonomic system and explained by some vasomotor excitants, such as tobacco and alcohol. Sedatives, such as belladonna, hydrotherapy, and satisfactory hygiene, are indicated.

2. Cyclic Type. This type includes those cases in which, persistently and regularly, the same symptoms occur. In other words, the ingestion of food is succeeded by the same clinical manifestations. It is divided into two phases; the first, vasomotor, and the second, pain or discomfort. The vasomotor phase is attended by all the symptoms accompanying the previous type, and usually appears immediately after the meal and lasts for a short time, fifteen minutes or more. From one to several hours later the pain phase follows, occasionally early, more often late. The discomfort is more often a burning, more rarely cramp or lancinating pain in the epigastrium, sometimes it radiates to the back, to the sides of the ribs, or through to the esophagus. The author discusses the significance of these findings, and finds the explanation in purely functional disturbances, hypersecretion, etc., or to the existence of true organic disturbances and even stenosis. The author believes, however, that the stomach is inflamed in all these cases, and the inflammation is to be found near the inferior part of the organ around the pylorus. There

²⁷ Presse Médicale, June 20, 1918, p. 309.

is tenderness over the pyloric, gall-bladder point, and frequently over the

region of the pancreas.

3. Inverse Type. In this type the pain or discomfort, instead of being late, is immediate, and may be followed by various subjective symptoms later. There is tenderness, however, not merely in the epigastrium, but under the left costal margin, and the whole evolution of this type, according to the author, indicates trouble not with the lower part of the stomach but in the upper part of the organ. This type corresponds to the toxic manifestations seen in dyspepsia due to alcohol (dyspepsia par intoxication gazéuse) and by auto-intoxication.

4. Mixed Type. In this type the two preceding types are included, but the congestion, instead of involving simply a portion of the stomach, involves the whole organ. In this type the pain and discomfort is both immediate and late (precoces et tardives) with nausea, and occasionally

vomiting.

The author believes that a division into these types will aid the average physician in differentiating the digestive types. There are, however, certain criticisms to be made of such a division. In the first place, the common symptoms accompanying the most diverse digestive disturbances, it is true, may be due to a similar mechanism, but the causation of this mechanism is so diverse that no such subdivision can serve a useful purpose. Again, it is by no means certain that the syndromes described above are due to congestion or inflammation.

Method of Treatment for Gastric Affections. There is a condition which dominates gastric pathology, namely, the so-called "douleur tardive" or pain some time after the ingestion of food. This sensation of burning, or weight or discomfort is a symptom which is seen in practically all gastric disturbances, frequently widely diverse in their pathological factors; for instance, cancer, ulcer, ptosis, the syndrome of Reichmann, pyloric stenosis can all produce this symptom. The author therefore correctly raises the point as to whether there is not a common cause for these manifestations as a sign of the most dissimilar disease processes.

Meunier²⁸ seeks the solution of this problem in a study of the cryoscopy of the gastric contents. The concentration of the gastric juice can be determined by means of the cryoscopic index. In other words, the physical law (Raoult) states that the reduction of the freezing-point is proportional to the number of molecules held in solution. He determined, for instance, the curve of the freezing-point after a meal of bread and one of meat. After bread, the freezing-point is usually high $\Delta = 0.70$; after ten minutes, or more, it becomes reduced and, as digestion proceeds, the freezing-point becomes less and less. For instance, the following table is typical:

²⁸ Presse Médicale, November 15, 1917, p. 647.

After an exclusive meat diet, during the first ten minutes the cryoscopic index is low $\triangle = 0.15$, then it progressively increases with the progress of digestion. For instance, the following averages were found in 5 normal cases:

10 minute	S								$\triangle = 0.12$
1 hour									$\triangle = 0.23$
1 hour									$\triangle = 0.30$
1 hours									$\triangle = 0.34$

In other words, while with bread the curve progressively decreased to a minimum of 0.35; with meat, it progressively increased to a minimum of 0.35.

From these studies it is deduced that the cryoscopic index differs with different food elements but always progresses toward the end of digestion to a common index of $\triangle = 0.35$.

With pathological conditions, however, an entirely different state of affairs exists, and with different cases the following findings occurred:

Diagnosis.	Т	ime	of extraction contents.	Index.
Cancer of fundus of stomach			1 hr. 20 min.	$\triangle = 0.67$
Pyloric stenosis			2 hrs.	$\triangle = 0.72$
Ptosis			1 hr. 25 "·	$\triangle = 0.59$
Reichmann's disease			1 hr.	$\triangle = 0.49$

From these studies it was evident that the concentration or cryoscopic index at the moment of evacuation was always greater than 0.35. From these, the conclusion is reached that when the concentration is different from the normal concentration, symptoms of pain are produced.

The pathological phenomena are due to trouble in evacuation and abnormal concentration of the gastric contents, and successful therapy will seek to favor evacuation and reduce the concentration of the gastric contents to its optimum of 0.53. It is therefore logical to dilute the gastric contents at periods of pain with a solution of that concentration. The following solutions represent a cryoscopic index in the neighborhood of 0.35.

									0.00 1000
Bicarbonate of soda									9.00 p. 1000
Dry citrate of soda									20.00 p. 1000
Dry sulphate of soda									10.00 p. 1000
Dry surphate of soua				•					11 00 n 1000
Phosphate of soda .									F 50 - 1000
Chloride of soda "									5.50 p. 1000
Pentone									40.00 p. 1000
Acid hydrochloric off.	(le'm	onal	. 1						9.35 p. 1000
Acid hydrochioric on,	(1.1	GHGI	1)				•	•	26 80 2 1000
Acid phosphoric (Fren	ich)								20.80 p. 1000

Clinically, these solutions are taken every ten minutes during pain. From these observations the author deduces the so-called "omnibus" treatment for all gastric disturbances: At the finish of gastric digestion, at the moment of painful sensations, regardless of the origin, have the patient take a solution of one of the salts, the important point being that it is of the correct molecular concentration.

Adrenal Dyspepsia. Loper, Beuzard and Wagner²⁹ first mention the gastro-intestinal troubles of Addison's disease, such as almost permanent anorexia, atonic dyspepsia and constipation, occasional exacerbations of vomiting, gastric and intestinal crises. These symptoms may appear in a restricted degree in the overworked and in the convalescent soldier as a result of adrenal insufficiency. Adrenal dyspepsia is not a very painful type. At any time from a half-hour to two hours after eating we note the presence of aërophagia and gastric distention. Constipation is persistent and obstinate, with occasional reactionary crises of diarrhea. Paroxysms of colic and vomiting are rarely seen. There is often much emaciation proceeding from lack of aliment due, in turn, to permanent anorexia. There is absolutely nothing to implicate the adrenals. Analyses of stomach contents and stools, and the x-ray, bring out nothing characteristic. There is often low blood-pressure, which could readily be the result of the condition, and not necessarily due to adrenal hypofunction. This is equally true of Sergent's white line. Asthenia is not extreme and melanoderma seldom present. Certainty is found only in blood analyses and in the results of treatment. The former are naturally difficult and are unnecessary when the test is so readily applicable. Injections daily—or every other day—of a half or one milligram of adrenalin often are productive of the most surprising results, even although in many cases no benefit accrues. The third injection may be followed by complete restitution of function. In such cases we see the blood-pressure rise and the asthenia disappear, and there seems no room for doubt that there is such a malady as "capsular dyspepsia" and that we have cured it. The mechanism is still obscure, because we do not know to what extent the sympathetic and cerebrospinal nervous systems, smooth and striped muscle, and glandular cells are individually acted upon by the drug.

Achylia Gastrica. Held and Gross³⁰ discuss in detail the subject of achylia gastrica, and explain the condition as a clinical manifestation shown by the persistent absence of free, as well as combined, acidity and also by the absence of ferments. Whether it is true that the absolute zero figure is essential to diagnosis of this condition, we are not prepared to state. In fact, there is often a negligible total acid figure due to the constituents forming the test-meal. The authors discuss the various opinions regarding the pathology of this disturbance. Under this heading a brief consideration is given to the question of vagotonic and sympathicotonic gastric conditions, and we meet with the rather surprising statement that it is "reasonable to suppose that a prolonged sympathicotonia inhibiting gastric secretions would eventually lead to atrophy of the gastric glands."

A true total atrophy, in the Reviewer's estimation, rarely occurs, and when it does it is almost always associated with frank pathological findings in the mucous membrane.

Le Progress Médical, August 25, 1917, p. 344, Article, July 21, 1917.
 American Journal of the Medical Sciences, August, 1917, cliv, 196.

The authors divide achylia into three groups:

1. Achylia gastrica, with destruction of gastric glands either on the basis of chronic progressive gastritis (Küttner), or carcinoma, linitis, plastica, alcoholic gastritis with cirrhosis of the liver (Lockwood).

2. Achylia gastrica accompanying marked secondary and primary anemias. To this group belongs the achylia of primary pernicious anemia; the marked anemias accompanying tape-worm; the lowered acidity and even achylia in syphilis, as well as the achylia described in chronic rheu-

matism, gout, hyperthyroidism, etc.

3. Achylia gastrica of a functional nature. To this group belong the great majority of cases in whom there is a demonstrable disturbance of the vagosympaticus system with a predominating sympathicotonia of the gastric secretion. Another interesting statement is the following: "the achylia gastrica cases secondary to gall-stones and appendicitis or other intra-abdominal diseases, as pointed out by Lockwood, are also in most cases based on sympathicotonia." It has been our impression that in most instances these diseases produce vagotonia, and the number of cases of achylia accounted in these cases was no greater than that seen in any other condition.

Diagnosis is based on an examination of the stomach contents and the stools. This follows the conventional method, namely, the demonstration of the lack of free and combined acid and enzymes in the gastric contents, and the presence of connective tissue in the stools. In this paper some interesting remarks are made relative to the x-ray manifestations of achylia. The filling of such a stomach is described as slow, that is to say, the food and contrast material (opaque meal) goes only slowly to the bottom of the stomach, the reason being, according to this paper, (1) the unusual dryness of the gastric wall, and (2) the large size of the air chamber "interferring with the action of the diaphragm, which, according to Cannon, is so important in filling the cardiac end of the stomach with food and furthering it toward the pyloric end."

These explanations require further investigation, and certainly are open to question. Furthermore, in achylia gastrica, because of the absence of the secretions, the initial peristaltic wave is absolutely missing, while the period of latency is unusually prolonged. When contractions appear, they are superficial, and are induced by the mechanical influence

of the food.

These authors state that the differential diagnosis is to be made between gastritis anacida, syphilis of the stomach, carcinoma ventriculi and heterochylia (Hemmeter). The achylia of gastritis anacida is differentiated by the absence of mucus, the complete absence of ferments,

the non-return of acids by foods stimulating the secretions.

From carcinoma, achylia is differentiated by the higher total acidity in carcinoma, the presence of considerable mucus, the increase in free leukocytes, if stagnation, the Oppler-Boas bacilli and lactic acid. The Wolff-Jungens method for the determine of soluble albumin, and the Smithies method for the demonstration of the Oppler-Boas bacilli (the polychrome methylene blue-agar method), the glycyltrytophan and,

finally, the determination of the formol index are given. From syphilis, the Wassermann and the Noguchi reaction serve to differentiate the case. Heterochylia, a condition which Hemmeter demonstrated in which there is a great tendency to changes in acidity can only be cleared up by careful

observation and repeated examination.

This should be strictly individualized, and should be separated into three groups: (1) Those in which the achylia is associated with a general neurosis, in which all the precautions should tend to improve the patient's general condition, hydrotherapy, and a dietetic regime which need not be strict but in which Fletcherization is insisted upon; (2) those in which the gastric symptoms predominate, continuous burning pain after meals and pressure, which these authors are inclined to believe is due to an underlying neurosis; here again the diet should be individualized and they prefer to give what they call a regime which spares the digestive organs, warm milk, cream, yolks of eggs, later thin cereals, toast, bouillon with egg, beef soup, vegetable purées, such as mashed potatoes with butter, and finally a diet which they call an exercise diet to stimulate these organs. This should not begin until

the acute symptoms have disappeared.

The following is given as an example of what an achylic patient should take and be fairly free from disturbances. In the morning on an empty stomach, about three-quarters of an hour before breakfast, 250 c.e. of hot water to which a half teaspoonful of sodium chloride is added. Breakfast, orange juice or grapefruit, then eggs in any form with the exception of hard boiled eggs, cocoa or light coffee or tea, graham bread or rolls with butter. Two or three times a week we replace the eggs by cereals, mashed potatoes, noodles, macaroni, or cream cheese. Dinner, grapefruit, caviar or anchovies, sardines, sardelles or appetizers, then some bouillon or beef soup or well prepared vegetable soup mildly spiced. Of the meats, either fish, chicken, lamb, yeal or cooked ham, calfs' brain, fresh sweetbread or even steak can be given, but thorough mastication is essential. Vegetables can be given, and a cereal, noodle pudding or omelette, or prune souffle and cooked fruits. At 4 P.M., one cup of buttermilk with zwieback or toast and butter. Supper, like breakfast, with the addition of some cooked fruits, and buttermilk should replace coffee. (3) Those cases in which diarrhea is the main symptom. In a number of cases the discovery that the diarrhea is due to achylia gastrica gives us an encouraging hint that the diarrhea will be favorably influenced by the proper treatment. The treatment, however, must be individualized. Patients who have not the symptoms and signs of enteritis are benefited readily by the removal of the milk, by interdicting meat for a few days, and then gradually returning to well-done and finely-chopped meat, not exceeding 200 to 250 grams a day. Raw fruits and coarse vegetables (beans, cabbage, lentils, etc.), must be forbidden. The diet consists of eggs, water, cocoa, fine cereal (rice and barley in particular), with butter, toasted white bread, macaroni, fish, and cream cheese, and three-day kumyss. Of the drinks, red wines are beneficial. Medicinally, hydrochloric acid and pepsin with, and after, meals, and calcium citrate or calcium phosphate (Boas) in teaspoonful doses in a tumbler of water before meals, are beneficial.

In more obstinate cases of diarrhea and especially when the symptoms point toward enterocolitis, the diet should be restricted to strained barley soups, water cocoa, tea, rice, or sago, soups, cooked in water to which cinnamon is added for the taste, and almond milk. Almond milk is prepared as follows: Forty sweet almonds and two bitter almonds are placed in boiling water for a few minutes then the almonds are peeled and ground. Add half a pint warm water, stirring constantly, and pass through a cloth. It should be allowed to stand on ice for two hours before drinking, and should be freshly prepared every day. One hundred grams of red wine are allowed in the course of the day. Such a diet is to be continued for three or four days, during which time the patient should stay in bed, with hot poultices or a Pressnitz compress applied to the abdomen.

Medicinally, we start with 20 grams of castor oil, followed by tannigen 0.2 to 0.3 gram, or tannalbin 0.5 gram, two or three times daily. If there is still intestinal irritation, saline enemata (2 teaspoonfuls to the quart) will prove beneficial, or an infusion of chamomile tea. The return to a

more substantial diet should be gradual.

For at least one month the following diet list will prove efficacious: Breakfast. One or two soft boiled eggs, four slices of toast or zwieback with butter, 250 grams water cocoa to which one or two yolks of eggs are added.

At 10 A.M. One cup bouillon.

At Noon. Barley or rice soup, spring chicken or lean fish. Vegetables: two tablespoonfuls finely mashed potatoes or spinach or carrots in purfer form. Should these vegetables not prove irritating and the patient stands it well, we increase the quantity of vegetables. Farina pudding and 60 grams of red wine.

At 4 P.M., 250 grams almond milk or water cocoa with zwieback.

At 7 p.m. One or two eggs, cereal with butter, or barley soup. Oatmeal and barley should be strained. Toast and butter. Water cocoa with yolk of one egg. HCl and pepsin are beneficial, while astringents will probably not be necessary. Should, however, the enteric symptoms persist, it is evident that we are confronted with an infectious enterocolitis either brought about, as claimed by Ad. Schmidt, by increase in the existing colon bacilli, or by the existing pathogenic organisms, because of the favorable soil and the lowered resistance of the patient. In this state, milk, astringents, and intestinal antiseptics are necessary. The efficacy of astringents, like bismuth subnitrate (0.5 to 1), or dermatol (0.5), tanningen (0.3), tannalbin (0.5) three times daily, is well established.

ACHYLIA GASTRICA AND TISSUE LIENTERY. Jones,³¹ in a study of 245 cases of achylia, presents the salient features accompanying the condition in the following Table I. He claims that achylia usually

³¹ American Journal of the Medical Sciences, March, 1918, No. 552, clv, 337.

occurs in the too rapidly emptying stomach in the broadly-built, nonptotic person. The association of dysentery is seen in the second table.

TABLE I.—NUMBER OF CASES, 245.

Sex. Males, 96 . 1 Females, 149	Under 15 to 8 years 0 years	15 to 25 7 9	25 to 40 13 57	40 to 60 59 75	Over 60 16 15
					Connective tissue in stools.
Exciting causes	Leading to gene Absent or unred Gastro-intesting	eorded .	nia		. 143 . 98 . 239
Symptoms	Wholly referred Asthenic type Bread	l			. 43 . 132 . 113
Build	es				. 81 . 182 . 62
General asthenia Dysentery	Absent Unrecorded				. 1
Constipation . Mucous colitis	Present				. 157 . 35 . 130
Connective tissue in stool	Good				. 66 . 46 . 141
	Fair or poor . Unrecorded .				. 55 . 49
TABLE II.	ACHYLIA GAS	TRICA, R	ESUMÉ O	F 28 CASE	S.
Build	$\left\{ \begin{array}{l} \text{Asthenic type} \\ \text{Broad type} \end{array} \right.$. 19 . 9 . 17
Position of stomach	Low Normal				. 11
	(Constipation			0	Connective tissue in stools.
Less than 4 hours, 2	Normal Dysentery			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 1 9
Four hours or over, 15	Constipation Normal Dysentery			1	1 0 1
Less than 4	Constipation Normal Property			1	1 3

Rehfuss³² discusses the question of diarrhea accompanying achylia. His conclusions are as follows:

Dysentery

Dysentery

Normal

Constipation

hours, 5

Four hours or

over, 6

3

6

()

()

1. Gastric achylia may be due to a number of different etiologic factors inducing in each instance presumably a different type of the disturbance. Instances of psychic, infected, anemic and duetless gland types are given.

³² Journal of the American Medical Association, October 20, 1917, lxix, 1328.

2. Studies on achylia seem to indicate that either the entire cycle of gastric digestion, or only certain phases, are affected, which enables

us to make a differentiation in types.

3. Achylia may be found in apparently normal persons, and studies in one such case indicate that there is a secretion formed without enzymes or acidity, but probably possessing other properties which as yet are not clear.

4. Artificially delayed secretion and induced achylia, as well as the

normal types observed, were all unaccompanied by diarrhea.

5. The injection of partially digested material, or even irritants, into

the duodenum fails to induce diarrhea.

6. In the so-called gastrogenous diarrheas the cause is to be found in an associated condition besides achylia, namely, an enteritis most frequently, or, if not an enteritis, it is in all probability due to a disappearance of the normal protective barrier of the gastric hydrochloric acid. The lack of the acid alone, however, seems insufficient as an explanation of the cause.

7. Implantation of an intestinal infection, or possibly a common

cause, inducing both achylia and enteritis, may be responsible.

8. In only one case was it possible to discover any associated pancreatic disturbances.

9. A method of fractional and continuous administration of hydrochloric acid is given as a new method in the treatment of this condition.

Gastric Cancer. Early Diagnosis. Bassler³³ makes the plea to "diagnose away from cancer" age—that is, to consider first the cancerous possibilities of the case. The author goes on to say "it is stated that in only 2 per cent. of chronic ulcer does cancer develop." He takes issue with the much large figures of the Mayo clinic. In 320 cases of gastric cancer examined by Bassler up to three years ago, only 5 per cent. had a history suggesting ulcer, 192 were operated on and, as far as his records go, all are dead. The author considers the history of first importance, with laboratory and x-ray data dividing honors. Mention is made where either one failed and the other succeeded. He divided his cases as follows:

Two main groups, those which are situated at the orifice and those in the body. Practically none, excepting possibly the few ulcer cases, will be diagnosed early enough for cure. The latter have no local symptoms until a large part of the stomach is diseased, and then the symptoms are general as well as local, as in all late cases. A few of these patients, however, come under observation fairly early, and they should be operated upon, but in by far the larger number they do not come to any medical man until marked extension of the disease is present.

The second type are those at the orifices, pylorus, or cardia, and these are more fortunate. Suggestive and pronounced subjective symptoms come on quickly and are often distinct; the slight nausea, coming on perhaps only late in the day; the bitter taste suggestive of a stagnant stomach; the occasional vomiting of foods retained from the previous meal or

³³ New York Medical Journal, August 11, 1917, p. 252.

even before this, although this is a late symptom; the relaxed stomach, and possibly its visible peristalsis if sufficient tone is still present and the obstruction is distinct enough. With these are also the danger signals of anorexia and perhaps aversion to meat; neither are pronounced in the early case and only suggestively present. All of these serve as beacons on the trail, although the lights may be only barely visible in the darkness.

When the growth is at the cardia, there are difficulty in swallowing never before present and attendant esophageal distress which may be

minor in nature, yet definitely present.

Mayo³⁴ gives the results of operations on cancer of the stomach over a period of twenty years. Six hundred and fifty-one resections on the stomach were performed for cancer. Of 427 patients who were operated on over three years ago and who recovered from operation, 311 have been traced, 120 (38.6 per cent.) were alive three years or more after operation. Three hundred and thirteen patients were operated on over five years ago, and of those who have recovered from the operation, 239 were traced. Of these, 62, or 26 per cent., were alive five years or more after operation. Beyond the five-year period no special effort was made to trace these cases, but we are told that 35 lived six years or more after operation, while 3 lived three years or more. One actually lived more than fifteen years after operation.

Gastroptosis. Pauchet²⁵ discusses the subject from the standpoint of abdominal orthopedics. He claims that there is a displacement, or an elongation, of the stomach and colon in 50 per cent, of the women and 20 per cent, of the men complaining of abdominal disturbances. Abdominal ptosis can involve all the organs of the abdomen or simply a few. It most frequently attacks the transverse colon and the stomach (gastro-

coloptosis).

There are three principal causes: Corsets, pregnancy, and emaciation, and there are two types, congenital and acquired. In the later type the role of pregnancy and emaciation is an important one. The corset produces a constriction at the base of the chest, interferes with respiration, and induces a visceral dystrophy by insufficient respiratory action.

The symplems produced by gastrocoloptosis are easy to explain: The stomach is suspended from the diaphragm and liver by the esophagus, and the gastrodiaphragmatic, gastrohepatic, and gastroduodenal ligaments. Between the layers of these ligaments the vessels and nerves reach these organs; therefore, when the ptosed stomach is filled it pulls on the solar plexus and provokes nervous troubles. The liver pushed away from the thorax depresses the stomach, and the traction of the gastrohepatic and gastrophrenic ligaments provokes pain at the left of the epigastrium. This discomfort and pain is always worse after meals, and when the patient is in the upright position. In this condition the transverse colon also becomes prolapsed, while its lateral extremities are fixed, so that there is an accentuation of the normal flexures pro-

Surgery, Gynecology and Obstetrics, April, 1918, No. 4, xxvi, 367.
 Presse Médicale, April 11, 1918, p.199.

ducing progressive constipation during the early stage; these kinks are reducible but later they become definite, so that there is an increase in

stercoral stasis, producing general intoxication.

Regarding the congenital or virginal form of gastrocoloptosis, a short time after the young girl has commenced to wear a corset, usually about the age of puberty, she presents the first symptoms. Constipation, headache, lack of appetite, and cardialgia. This cardialgia is manifested by discomfort or pain in the epigastrium, especially pronounced after meals or in the upright position. X-rays show a low stomach, but otherwise no modification. The quantity of nourishment influences the symptoms much more than the quality. General symptoms and circulatory disturbances are induced by kinking of the mesenteric vessels and traction of the solar plexus, heaviness in the back, vague abdominal pain, extrasystoles, orthostatic tachycardia, general fatigue, menstrual disturbances (irregular, painful, retarded, or absent periods).

In the maternal form, the gastrocolic ligament may become elongated from 2 to 15 cm.; in the differential diagnosis, many things can be mistaken for this condition, in fact abdominal ptosis can give rise to the most diverse diagnosis: Left-sided salpingitis, if the pelvic colon is tender; double salpingitis if the cecum and transverse colon are in the pelvis in contact with the uterus; movable kidney if the cecum is distended and resists palpation; cholecystitis, if the right angle of the colon is painful; gastric ulcer if there are pains after meals; chronic appendicitis if the maximum amount of pain is in the right iliac fossa; dilatation of the stomach owing to a splash; and enterocolitis if the preceding

conditions can be eliminated.

TREATMENT. The medical treatment consists of absolute rest in bed, for several weeks, which improves the condition not merely by means of the rest and replacement of the organs in their position, but also because of the amount of fat deposited in the abdomen. General and abdominal exercises and massage are indispensible; the various abdominal bandages afford considerable relief. A good abdominal bandage will fulfill the following conditions: (a) It should exercise precise and constant pressure on the abdomen, it should be exactly placed either by means of the x-rays or by utilizing the so-called pain signal test of Leven; (b) it should be placed on the abdomen while the patient is in the recumbent position every morning. The bandages which give the best results, in the author's opinion, are the inflatable rubber bandage (Pelot à air d'Emriquez) and the support devised by Leven and Lane. The author makes the statement that the various forms of ptosis should not be considered as purely local lesions, nearly always there is a complex pathology. Insufficiency of certain glands, like the liver and adrenal, degeneration of certain tissues and disturbed equilibrium of the nervous system. This article also includes a resumé of the operative measures to be used in handling this condition.

Primary Phlegmonous Gastritis. In an editorial this subject was discussed. It now seems clear that this disease, while not generally recog-

³⁶ Journal of the American Medical Association, October 20, 1917, lxix, 1354.

nized, is not as infrequent as was supposed, and belongs to the group of streptococcic infections. This disease may implant itself upon chronic ulcer or carcinoma, and be the immediate cause of death. The interesting cases, however, are those in which the disease appears to be primary in the stomach. Engo described a case just like this, and states that the streptococus is the sole infecting organism in 70 per cent. of the reported cases of primary phlegmonous gastritis, while the remaining 30 per cent, is associated with the staphylococcus, colon bacillus, or the

pneumococcus.

The chief predisposing conditions were chronic alcoholism, dietetic errors, food and drug poisoning. Streptococcus gastritis occurs five times more frequently among males than among females. Secondary phlegmonous gastritis is not uncommon, and Rixford³⁷ reported 4 cases, 3 of which occurred during an epidemic of streptococcal sore throat, in San Francisco. The symptoms are sudden and severe from the onset, persistent vomiting, fever, early prostration, and a burning sensation in the stomach. The disease runs a rapid course in from three to five days, and is usually fatal. The mucous membrane of the stomach is thickened, pale and swollen, and may be intact or necrotic, depending on the extent of the process. The submucosa is usually very markedly thickened and infiltrated with an exudate of fibrin and leukocytes. In this exudate the streptococcus can easily be demonstrated.

Stapelmohr³⁸ presents 2 cases of phlegmonous gastritis in which the disease was localized to the pyloric region. This area was removed, but instead of the supposed cancer, the microscope merely revealed phlegmonous gastritis. One patient, aged fifty-nine years, had fever and vomiting; the other, a woman aged thirty-three years, had gastric symptoms for three years. Both patients were apparently cured by operation. There was evidence of a chronic hyperplastic gastritis in both cases.

Syphilis of the Stomach. Downes³⁹ reports 8 cases of gastric syphilis. It will be recalled that Smithies reported 26 cases several years ago, and LeWald and the author reported 8 cases of the disease in March, 1915. Syphilis of the stomach may be congenital or acquired. The lesions vary from a diffuse syphilitic gastritis to localized or general gummatous infiltration involving all the coats. Perigastritis, and pyloric obstruction may occur besides the lesion in the stomach; other evidences of the disease are usually found, such as changes in the liver, extensive involvement of the gastrohepatic and gastrocolic lymph glands, as well as other evidence of generalized syphilis.

The symptoms may resemble other diseases of that organ, but there are several striking differences: The pain, which is frequently seen, lacks the periodicity of ulcer and is not much influenced by food. It is frequently worse at night, vomiting is a persistent, annoying symptom, and, accompanying it, is usually rapid loss of weight. Laboratory studies show that an absence of free acid and a low total acidity is usually present in extensive involvement of the gastric mucosa. The resistance to

³⁵ Annals of Surgery, 1917, lxvi, 325.

^{**} Hygica, Stockholm, July 31, 1917, lxxix, p. 708.

Surgery, Gynecology and Obstetrics, October, 1917, p. 371.

dietetic and ordinary medicinal treatment, the positive Wassermann, and the x-ray findings will usually suggest the diagnosis. Here again, the possibility not merely of obstruction from the active region, but also from active cicatrization must be borne in mind. In 5 of these cases gastro-enterostomy had to be performed to relieve obstruction.

Tuberculosis of the Stomach. Broders⁴⁰ draws the following general

conclusions after a consideration of this subject:

1. Little was known of gastric tuberculosis before the middle of the nineteenth century.

2. Gastric tuberculous lesions have practically the same gross and

microscopic appearance as tuberculous lesions of the intestines.

3. A specific reason for the relative immunity of the stomach to tuberculosis still remains unknown.

- 4. The gastric juice appears to have a very slight effect on the tubercle bacillus unless the contact extends over a period of at least twelve hours.
 - 5. It is possible to produce gastric tuberculosis experimentally.6. The exact mode of infection is often difficult to determine.
- 7. The theory that gastric tuberculosis is always secondary to intestinal tuberculosis has been disproved.
- 8. About half of the cases reported as gastric tuberculosis should be

classified as doubtful or rejected.

- 9. Adults are affected more often than children, the ratio being 3 to 1.
- 10. Males are affected more often than females, the ratio being 2 to 1.
- 11. Ulcer is the predominating lesion in the positive and probable cases, constituting 81.6 per cent. of the former, and 80.5 per cent. of the latter.
- 12. In the positive cases the lesser curvature is the most frequent site of the ulcer or ulcers, the pylorus leading in the probable cases and in a combination of the positive and probable cases.

13. In tuberculosis of other organs associated with gastric tuberculosis

the lungs take the lead, closely followed by the intestines.

14. No case of tuberculosis of the stomach has been absolutely proved

to be primary in the stomach.

Abnormal Proliferation of Gastric Mucous Membrane Following the Ingestion of Wool Fat. Kon⁴¹ records the interesting observation that after feeding rabbits and rats with daily doses of from 5 to 10 grams of wool-fat, he was able to demonstrate, in 50 per cent., nodules and adenomatous proliferations in the pylorus where this material accumulated. In some cases the proliferation was great. One rabbit presented an enormous adenoma, while another, under the same conditions, had only a minute lump, but in this animal there was a tubular adenoma in the liver with considerable lipoidosis. The tongue, gums and lips also displayed a similar tendency to papillomatous proliferation. There was also in some a tendency to deposits of lipoid in the skin and falling of the hair.

 $^{^{40}}$ Surgery, Gynecology and Obstetrics, 1917, p. 501. 41 Gamm, Tokio, October, 1917, xi, 27.

Medical versus Surgical Treatment in Peptic Ulcer. J. N. Hall, M.D.42 In his abstract on "Consideration of the Merits of Medical and Surgical Treatment Respectively in Peptic Ulcer," Dr. Ross gives the following

disadvantages of medical treatment:

1. Uncertainty of diagnosis, as mentioned. Let no one underestimate the danger of incorrect or incomplete diagnosis in these cases, no matter how skilful the attendant. One of Leube's supposed ulcers recovered promptly after twenty-five years of suffering when his appendix was removed, under my care, and the stomach was found perfectly normal. I have seen a score or more of similar cases.

2. Frequently complete failure of medical treatment.

3. Likelihood of relapse. Probably more cases relapse than remain well, if they return to the usual habits of life. This certainly does not hold in cases treated surgically, so far as my observation goes.

4. Danger of hemorrhage and perforation. We may hope to dismiss

these dangers after operation, in nearly all cases.

5. Fear of development of the invalid habit, of chronic nervous prostration, chronic nephritis, arteriosclerosis, generally lowered resistance, with tendency to the development of tuberculosis or other chronic disease. The danger of the morphine habit is appreciable.

6. Under medical treatment, we have the constant fear that malignant disease may develop. The presence of a high gastric acidity is not to be taken as evidence that cancer does not already exist, as I have learned

to my sorrow.

7. The complications heretofore mentioned and embolism, thrombosis, parotitis, phlebitis, etc., are too frequently encountered under medical treatment. We may repeat here that nearly all the mortality in peptic ulcer comes in some way from some complication. Obstruction by the ulcer, or by adhesions of the biliary and pancreatic ducts is a serious possibility.

8. There are, unfortunately, many instances of subphrenic abscess, empyema, pyopneumothorax, septic pericarditis, mediastinitis, etc., which result as late complications of slowly perforating ulcers, their

origin often wholly unrecognized.

Disadvantages of surgical treatment:

1. Danger of operation and anesthetic. In good hands the mortality of perhaps 1 to 3 per cent., considering the seriousness of the disease under treatment, is to be regarded as justifiable.

2. Subsequent development of adhesions, vicious circle jejunal ulcer,

These dangers are much lessened under modern measures.

Gastrojejunal ulcers are generally conceded to be surgical, since they are so commonly dependent upon the use, at the performance of the gastro-enterostomy, of a non-absorbable suture material which fails to come away. The less frequent jejunal ulcers are more amenable to medical treatment.

We should then weigh carefully the matter of the certainty of the diagnosis, the probability of relief by medical treatment, or of complete cure in favorable cases, the chances of relapse, the favorable or unfavorable physical condition of the patient, the danger of cancer, the possibility of relieving some complicating trouble by the operation, the favorable or the unfavorable occupation and surroundings of the patient, and to some extent, the patient's desires. There should be no bias in the medical mind in the favor of one line of treatment or another, excepting as

it is based upon all of the above considerations.

This paper represents the most concise summary of this important subject which I have ever seen, and yet it seems to us that the final results of gastric operations are by no means definitely settled. I have collected the statistics not only at home but abroad, and have been surprised at the frequency of postoperative findings, not merely immediately after operation, but three, four, and five years after operation. The reader should carefully study the article of Smithies on gastro-enterostomy before jumping at conclusions. I am more and more convinced of the necessity of operative procedures in diseases of the stomach and likewise more and more convinced of the possible complications involving these procedures. Operation relieves but often at a far greater price. We still know too little of gastric chemistry and physiology to say with certainty how efficient are operative procedures when a case can be gotten well medically.

Hardt⁴³ discusses the genesis of pain in the stomach and duodenum. The older view that pain is due to chemical irritation (acid), while Carlson contends it is due to muscular contraction. The author studied three

types of cases:

1. Carcinoma of the pylorus in which there were vigorous peristalsis

and a moderate degree of pain.

2. Healed ulcer of the duodenum with cicatricial contractions, high grade obstruction, and a very pronounced hyperperistalsis.

3. Typical peptic ulcer with vigorous peristalsis.

The method employed was as follows:

The patients employed for this work were carefully examined and diagnosed clinically by B. W. Sippy and his assistants. After the diagnosis was made, the procedure was similar to that of Ginsburg, Tumpowsky and Hamburger. Kymographic tracings of the stomach contraction were begun immediately after the patient had a meal and were continued until vigorous hunger-peristalsis was obtained. The patients all coöperated very intelligently. In each case the patient swallowed two tubes, one a Rehfuss and the other an ordinary tube with rubber balloon attached. By means of the Rehfuss tube, acids and alkalis could be administered, or the stomach contents could be aspirated from time to time without disturbing the patient. When the tracings were started, the patient was told to tap the key, to note the occurrence of pain. If the pains were mild, he tapped the key once; if severe, he tapped it twice; and when intense, he tapped it three times. The line below the tracings records the pain periods.

From the studies the author made these conclusions:

1. Ulcer pains may be present in the absence of free acid, and may be temporarily relieved by a 0.3 per cent. hydrochloric acid solution.

2. Gastric ulcer pains may be absent in the presence of high acidity.

3. Any active process (ulcer or carcinoma) producing a hyperirritable condition may result in pain, but the pains are intermittent, being synchronous with the contractions of the stomach, pylorus or duodenum, and bearing no relation to the degree of acidity.

4. Hypertension and hyperistals with high grade pyloric obstruction are not sufficient to produce pain in the absence of an active irritable

process (ulcer or carcinoma).

Perforations of Gastric and Duodenal Ulcer. Davis⁴⁴ discusses the question of perforated ulcer, and states that 20 per cent. of duodenal ulcers sooner or later perforate, while the same complication occurs in only 7 per cent. of gastric cases. This the author believes is due to the fact that the ulcer of the stomach has a greater tendency to become thickened and indurated.

In summing up the symptoms, he dwells upon the intensity of the pain and the fact that the patient can scarcely breathe, inasmuch as even ordinary respiration increases the pain. The tense, motionless attitude is in marked contrast to the restlessness of patients suffering from ordinary forms of colic—renal, intestinal, or hepatic. The statement is made that the torture from a perforating ulcer is even more intense than that due to the perforation of the gall-bladder or the appendix, a fact which is accounted for by the acid gastric juice coming in contact with the peritoneum. The author says that one might stand on the abdomen and make no impression on the board-like rigidity of the tensely contracted muscles. At first, the pain of perforating gastric ulcer is similar to that of a lesion in the duodenum, but, after an hour or two, there is a difference. The perforation of an anterior gastric ulcer produces pain and tenderness more generally over the abdomen, especially in the central and left abdomen, while the perforation of a duodenal ulcer is followed by the passage of fluid along the trough of the transverse colon toward the right, around the hepatic flexure and down along the outer side of the ascending colon to the right iliac fossa. It is in this way that a perforated ulcer of the duodenum will often be followed, in several hours, by maximum tenderness in the region of the appendix.

The remainder of the article is devoted to the discussion of the best operative procedure necessary to cope with this condition. It is his conviction that the less that is done, besides stopping the leak, and establishing satisfactory drainage, the better. Gastro-enterostomy can be done later. This operator never uses irrigation of the peritoneal cavity. Local and distal drainage, the Fowler position, and the Murphy

drip, complete the recommendations for treatment.

In an editorial to the Swedish reports on this subject are discussed. Thirty-five operative cases are mentioned, and, of these, it is pointed out that vomiting was absent in 13 cases, and constituted the initial symptom in only 3 cases. On the other hand, the disappearance of hepatic dullness was an important sign, being present in 87 per cent. There were 25 gastro-enterostomies, with 8 deaths. The author compiled records of 134 perforation cases by Swedish surgeons, with 33

Surgery, Gynecology and Obstetrics, 1917, xxv, 162.
 New York Medical Journal, December 22, 1917.

deaths. Lindstrom, who reports the material, had a mortality of 43 per cent., considerably higher than the average mentioned above; 9 patients died of peritonitis in the early days following the operation; 19 have resumed their normal occupations; and 16 are absolutely

without gastric symptoms.

Scully⁴⁶ states that in six years, there were 59 perforated ulcers admitted to the Cook County Hospital, 48 of which were gastric and 11 duodenal. During this same period there were 506 diagnosed gastric ulcers and 72 duodenal ulcers, showing that the frequency of perforation was 9.4 per cent. Of the perforated ulcers, 49 were operated on by ten surgeons of the staff, the remaining 10 autopsied. The statistics are as follows:

Age and Sex. In the gastric series 44 were males, 4 females. The duodenal series were all males. The majority in gastric ulcer occurred between thirty and forty, and the duodenal between twenty and thirty.

Previous Gastric Disturbances. 29 gastric cases and 6 duodenal cases

gave a history of various gastric distubances.

Prodromal Symptoms. Many cases gave no history of a prodromal disturbance. Twenty-seven gastric and 2 duodenal cases gave a history of some premonitory disturbance, the most constant of which was pain, usually slight, located in the upper abdomen. Vomiting occurred in several cases; in two there was a previous alcoholic excess.

Determining Cause. No definite cause could be assigned, but in 7 it occurred during heavy work; in several it occurred shortly after eating;

in a considerable proportion six to ten hours after eating.

Onset. In practically every case there was sudden, agonizing pain in the epigastrium, with vomiting in 35 gastric and 6 duodenal cases.

Period of Reaction. Following the sudden, agonizing pain, there is, usually several hours later, a period of remission or abatement of symp-

toms, in which the patient looks better.

Rigidity was present in every case, tympanites was noted in 16 gastric and 6 duodenal cases. Fluid was diagnosed in 14 gastric and 6 duodenal cases. Thirteen gastric cases were in shock on entrance, with rapid pulse, pallor, and subnormal temperature. Only a few cases showed a febrile reaction; they were usually late cases with general peritonitis. In early stages, the pulse was not increased in rate, although there was a slight leukocytosis. Later, the pulse and leukocytes increased. It is worthy of note that in the cases which recovered the pulse was never as rapid as in those which resulted fatally. This is probably due to a more virulent peritonitis and greater shock.

It is rather interesting to note the diagnosis in this series of cases:

					g	forated astric ulcer, cases.	Perforated duodenal ulcer, 11 cases.
Perforated gastric ulcer						21	3
Perforated duodenal ulcer						2	1
Acute appendicitis						6	3
Acute cholecystitis .		1				3	0
Acute peritonitis						13	4
Ileus	٠			٠		2	0
Liver abscess						1	U

⁴⁶ American Journal of the Medical Sciences, June, 1918, clv, 874.

Operation was performed in 40 gastric and 9 duodenal cases. The remaining cases were too severe to admit of operation.

Fluid. As a rule the peritoneal cavity contained a variable amount of fluid. It was present in 37 gastric and 9 duodenal cases. Free stomach contents were found in 10 gastric and 3 duodenal cases. In 2 cases the fluid was confined to the lesser peritoneal cavity.

Site of Perforation. The most common site was on the anterior wall along the lesser curvature near the pylorus. It was anterior near the pylorus in 43 cases, anterior in the cardia in 1 case, posterior in 4 cases. The posterior perforating ulcer of the cardia was associated with carcinoma of the stomach. In all cases of duodenal ulcer, the perforation was anterior near the pylorus.

PROCEDURE.

Gastric Ulcer.			Cases	Recovery.	Death.
Closure and drainage			. 26	12	14
Closure and gastro-enterostomy			. 5	4	1
Excision and suture			. 1	0	1
Drainage, not closed			. 5	0	5
Closure, no drainage				0	1
Gastrostomy				0	1
No operative record			. 1	0	1
DUODENAL ULCER.					
Closure and drainage			. 5	4	1
Closure and gastro-enterostomy				1	2
Drainage, not closed				0	1

Immediate Results. Of the 40 cases of gastric ulcer operated on, 16 recovered, and 24 died; and of the 9 cases of duodenal ulcer, 5 recovered and 4 died. Many patients died in shock in the twenty-four hours following operation. In other words, the operative mortality was 60 per cent, for gastric ulcer and 44.4 per cent, for duodenal ulcer. In the 16 cases of gastric perforation which recovered, 11, or 68.7 per cent., were operated on within fifteen hours after perforation occurred. In the 24 cases which resulted fatally, 6, or 25 per cent., were operated on within that time interval. In the 5 cases of duodenal ulcer which recovered, 3, or 60 per cent., were operated on in twelve hours, while in the 4 cases which resulted fatally, only 1, or 25 per cent., was operated on in the first twelve hours. In other words, early recognition followed by immediate operation offers the best hope of recovery.

Healing of Gastric and Duodenal Ulcer. Rocatgenological Studies. Hamburger, in studying the question of the cure of ulcer, resorts to a repeated x-ray examination, first studying the patient on admission and registering the findings on six to a dozen plates, then, after a period of medical treatment, submitting the individual to another x-ray observation, and, finally, the patient is asked to report every three months for a repetition of the studies. In other words, patients are examined before and after treatment at intervals for a period as long as one to two years, or more. He discusses the Haudek-Nischen symptom as more or less pathognomonic of ulcer, the studies of

⁴⁷ Trans. American Gastro-enterological Association, 1917, p. 44.

Cole on indurated ulcer, and the so-called spastic hour-glass of Faulhaber as evidence of ulcer. The results of studies on patients exhibiting these symptoms in gastric ulcer brought up the following points:

(1) It was obvious that this method is of value in studying callous

ulcer during the healing process.

(2) The complete disappearance of the projection coupled with the simultaneous improvement in clinical symptoms is strong presumptive

evidence of the healing of ulcer.

(3) The complete disappearance of the pocket cannot be interpreted as complete normal restitution of the stomach wall, but probably is to be interpreted as simply the filling up of the ulcer crater, with probably the formation of an indurated callous ulcer or thickened scar. The failure of normal peristaltic waves to continue through the ulcer area is positive evidence of a remaining pathological condition.

(4) The method is in no sense to be construed as an argument for, or against medical treatment, but is of distinct value in the selection of cases for medical or surgical treatment. Those cases in which the crater could not be made to disappear entirely under medical treatment

are undoubtedly worthy of surgical intervention.

(5) The method does not serve to rule out carcinoma. While in the series under observation, the author did not witness a lesser curvature ulcer which underwent malignant degeneration, still the possibility of overlooking an early cancer must be granted, as emphasized by Cole, Case, and others.

(6) Even though the ulcer crater has entirely disappeared, resulting in the production of an indurated scar, permanent cure may not have been obtained. For it is possible that this scar, as in scars elsewhere in the body, remaining a *locus minoris resistentia* may undergo secondary

breaking down with the formation of a fresh, active ulcer.

(7) Extreme care and countless reëxaminations in all positions, including the taking, if possible, of serial plates, must be insisted upon to avoid the danger of overlooking the persistence of a small crater pocket. Even with such precautions, the danger of overlooking such small projections must be granted.

(8) Normal peristalsis may at times be mistaken for penetrating

ulcer.

In duodenal ulcer, the findings have not been as valuable as those in penetrating ulcer of the lesser curvature.

The author's conclusions are as follows:

(1) A method of roentgenological study of the healing of gastric and duodenal ulcer is described. This method consists of the repeated roentgenological studies of ulcer patients before, during, and after medical treatment.

(2) This method is of value in the diagnosis, prognosis, control of medical treatment, and selection for surgical treatment of gastric and

duodenal ulcer.

(3) The method is of value in studying the pathology of the healing process in both clinical and experimental ulcer. Thus far, it is not of positive value in the differentiation of ulcer and cancer, although in

the future it may shed some light on the much discussed problem—the

frequency of malignant degeneration of calloused ulcer.

(4) In the use of the method the danger of mistaking normal peristalsis for penetrating ulcer and of overlooking the presence of a small ulcer, because of incomplete or insufficient examination must be borne in mind.

(5) These results are only presented as a preliminary report to stimulate work along similar lines. It is in no sense to be construed as the final word on the subject, for each new case, as it is studied, brings its own message and suggests new viewpoints and problems to be interpreted, thus amplifying and possibly negating the conclusions reached

in preceding cases.

RECURRENT SYMPTOMS AFTER OPERATION. Their Causes. Wilensky⁴⁸ discusses the cause of symptoms after the operative treatment of gastric and duodenal ulcer. He insists upon the fact that the patient is not through medical treatment after the operation has been performed. Almost always there are associated lesions present, or disturbances which require careful medical treatment before the patient can be gotten well. He divides the symptoms due to functional and anatomical disturbances.

Functional Disturbances. Vomiting is the most common, and, if not corrected, soon goes on to pain and gaseous eructations. Study revealed too great a food intake and with it unquestioned food retention in the stomach. These symptoms are usually controlled by rearrangement of the diet and systematic gastric lavage. Again, changes in the gastric secretion can occur so that the return to normal does not take place. The fall in secretion which should occur in hypersecretory cases does not occur, but may become more persistent, in which case the cause will be found to be due more to indiscretions in diet than any disturbance in the stoma. Postoperative constipation may occur, due to a continuance of a former condition before operation, or to general atony incident to the handling of viscera during operation. Diarrhea may likewise occur to disarrange physiological conditions in the stomach and bowel. Again, Mathieu and Savignac have pointed out several other conditions giving rise to diarrhea after gastro-enterostomy. These are (1) gastrocolic fistula, (2) incomplete stenosis of the bowel, and (3) jejunal ulcer. The first and second can be diagnosed by the x-ray.

Symptoms due to anatomical disturbances:

(1) Pain following operation, due to the want of accurate apposition in the suture line of the gastro-enterostomy or remaining after the excision of ulcer-bearing area with the development of a granulating area which, under proper conditions, undergoes healing.

(2) The cutting through of unabsorbable sutures.

(3) Peptic ulcerations at, or near, the stoma.

1. A reproduction of the original symptom-complex occurs within a short time after the operation and the patients believe that the old ulcer

⁴⁸ American Journal of the Medical Sciences, September, 1917, cliv, 387.

has reappeared. Progression may be very rapid, and perforation, with

its consequent peritonitis, may quickly arise.

2. The symptoms reappear within a short time after operation and continue much the same as before the operation. Most of the eases are in this second group. Sooner or later, too, most of these come to

secondary operations.

3. The symptoms develop slowly, and gradually a tumor forms in the upper abdomen. At operation one always finds that a fairly large jejunal ulcer has formed, has undergone subacute perforation and has become surrounded by a large mass of indurated and adherent intestine and omentum. Such a condition is best treated by jejunostomy.

4. A tumor develops as in Group 3. Suppuration occurs within it

and the abscess ruptures into an adherent hollow viscus.

(4) Contraction of the stoma or the opposite condition too large a

(5) Badly selected types of operations, such as pyloroplasty or badly executed operations which are prolific in the causation of kinks and other anatomical abnormalities resulting in poor function of the stoma.

(6) Lesions in neighboring organs may occasion trouble.

The following table is given, showing the anatomical defects occurring in cases operated upon in Berg's service at the Mt. Sinai Hospital:

	Mount Sinai cases.	Cases from literature.
Contracted pyloroplasty		2
Contracted or closed stoma	. 5	3
Induration at stoma	. 2	2
Murphy button		ن 1
Peripyloric adhesions	. 1	1 9
Adhesions		0
Kink of afferent loop		1 ()
Internal hernia		2
Healed ulcer	, 1	2
No ulcer	. 4	ĩ
Cholelithiasis	9	
Suture ulcer		
Gastrojejunal ulcer		
Open ulcer and contracted stoma		3
New ulcer	5	
Open ulcer at old site		

Gastro-enterostomy. Roeder⁴⁹ discusses the role of the transverse mesocolon following gastro-enterostomy. This article is extremely interesting, inasmuch as it points out the principles attendant on this operation. A gastro-enterostomy, the author claims, is no exception to the rule, that it is impossible to completely short circuit any portion of the gastro-intestinal tract, unless a complete obstruction is present; however, if the operation is properly performed, the irritating gastric juices are drained off as fast as collected, affording nature an opportunity to heal the ulcer.

We take exception to this statement, inasmuch as the chemistry of gastro-enterostomy shows that no such rapid evacuation occurs.

The author goes on to say that the good results attending gastro-

⁴⁹ Journal of the American Medical Association, October, 1917, lxix, 1320.

enterostomy have been attributed by many to the presence of alkaline bile and pancreatic juice in the stomach neutralizing the acid. In the face of this contention, he says that it is difficult to understand why a duodenal ulcer should become chronic when it is being bathed con-

stantly in an alkaline fluid.

Again, we must point out that duodenal ulcer does not occur except rarely in the alkaline portion of the duodenum, inasmuch as about 95 per cent. of duodenal ulcers occur in the first or acid portion of the duodenum. The statement is made that no definite proof exists that the presence of these fluids exerts either a beneficial influence or harmful influence on ulcer. The duodenal contents evidently play a negative role, and nearly all patients explored properly for persistent vomiting or indefinite distress, have shown a deficient drainage of the stomach, duodenum, or afferent jejunum if a secondary ulcer is not present.

The author cites several cases in which obstruction is caused by a too rigid opening in the mesocolon and the structure adjacent to it.

His conclusions are as follows:

1. A gastro-enterostomy is a mechanical affair, the chemistry of the alkaline duodenal contents playing a negative role.

2. It must assume a double function, draining constantly and freely the gastric and also the duodenal contents into the efferent jejunum.

3. A roentgen-ray examination may disclose the anastomosis working perfectly, with marked symptoms of vomiting, etc., owing to the fact that the duodenum is obstructed by the dorsal border of the mesocolon.

4. The point of origin through the mesocolon is not constant, and the anastomosis should be made accordingly in the most convenient direction.

5. Occasionally, the inferior border of the transverse mesocolon forms a distinct fold over the duodenojejunal flexure which, when attached to the bowel, may form a point of obstruction, even before, and also after, a gastro-enterostomy is performed.

6. If this fold at the time of operation is found to be developed sufficiently to constrict the bowel, it should be divided between ligatures.

IMMEDIATE JEJUNAL FEEDING. Andresen⁵⁰ uses jejunal feeding, having previously inserted a Rehfuss gastroduodenal tube well into the jejunum to commence feeding at once on the operating table with the peptonized milk, dextrose and alcohol mixtures. He considers that immediate jejunal feeding after gastro-enterostomy is not only a safe, but an extremely valuable, procedure to be recommended not only in stenosis but in all types of cases where a more certain and less uncomfortable method of postoperative administration of fluid and nourishment is to be desired.

After-results. Lippman,⁵¹ analyzing 100 cases of gastro-enterostomy, mentions, among difficulties, one gastrojejunal and two recurrent gastric ulcers; 6 patients reoperated on for adhesions, 5 more with acute recurrent symptoms of pain and gas due to adhesions, and 3 in which

⁵⁰ Annals of Surgery, May, 1918, lxvii, n. 5.

⁵¹ California State Journal of Medicine, January, 1918, No. 1, xvi, 38.

the stoma remained too large or too relaxed. These latter patients suffered from gas and distention immediately after eating. One of these had diarrhea, with undigested food in the stools. Twelve were not completely relieved of their symptoms, being unable to take a full meal or diet without hyperacidity, pyrosis and gas after eating.

This makes 29 cases with poor after-results, 8 fatal cases, 12 cases which could not be followed in this series, leaving 51 cases with good results. Of the fatal cases, 1 patient died of hemorrhage within twelve hours of operation, 2 of postoperative shock, 1 of peritonitis, and 4 of pneumonia. Four of the patients were practically moribund at

operation.

Gastric Function Following Gastro-enterostomy. An Analysis of 273 Cases. Smithies' paper⁵² is so concise, and at the same time so important, that I have taken the liberty in reviewing the paper to copy it in places almost verbatim, inasmuch as even the elimination of a few passages materially interferes with the value of the entire summary, which is undoubtedly the most comprehensive which has yet appeared. To April, 1917, 8826 patients suffering from gastro-intestinal disturbances came under the author's attention. Of these, 273 (0.31 per cent.) had gastro-enterostomy performed. These patients returned for reexamination and represented 11.6 per cent. of 2360 individuals upon whom operations were performed for diseases of the stomach and duodenum. These diseases were gastric ulcer, 571 cases; duodenal ulcer, 1469 cases; gastric cancer, 320 cases.

Of the 273 gastro-enterostomies, 170 were males, 103 females. The average age for males was 44.3 years, females 41.5 years; when they returned for postoperative examination, the average age was 46.1 years for males and 44.3 years for the females. In other words, the males returned on an average 1.8 years after operation and the females 2.8

years.

Posterior gastro-enterostomy without, or with, pyloric closure or local or extensive gastric resection, and combined with removal of the appendix, or removal or drainage of the gall-bladder was the operation of choice in 95.4 per cent. of cases. In 4.24 per cent., anterior gastro-enterostomy was performed. In one patient, through faulty anatomical orientation at another clinic, a gastro-ileostomy had been done under the impression that a gastro-enterostomy had been performed. This

patient survived nearly a year.

Of the entire series (273), there were 104 patients (38.09 per cent.) who were definitely dyspeptic, although they stated that the operation was followed by improvement. There were 20 patients (6.9 per cent.) in whom gastro-enterostomy was followed by no improvement whatever in digestion. Fourteen cases (5.1 per cent.) seem to have experienced an aggravation of their dyspepsias postoperatively. It is evident from this series, that but 20.9 per cent. were complaint-free, 49.8 per cent. were clinically comfortable, and in 87.89 per cent. subjective benefit had accrued from the operation.

⁵² Tr. American Gastro-enterological Association, 1917, p. 62.

Postoperative Symptoms in Patients not Dyspepsia-free. There were 216 such patients. The summary seems to make it apparent that where the surgery has been done for the relief of cancer and postpyloric ulcer, abdominal distress, anorexia, nausea, vomiting gas, "water-brash," and constipation were more frequent than where the operative indication had been gastric or pyloric ulcer. Eructations of food and diarrhea were more frequently seen with gastric ulcer cases. Very few gastric cancer cases returned for examination following an operation, as they were all in a bad way. Weight loss has been experienced by nearly one-sixth of the gastric and pyloric ulcer class, by more than one-fourth of the duodenal group, and all the cancer patients.

The incidence of gross hemorrhage following the operative procedures is important. It would indicate a delay in healing, recrudescence of the original complaint or malignancy, or even the occurrence of the new lesion (ulcer). In more than 6 per cent. of gastric and pyloric cases, more than 17 per cent. of the postpyloric duodenal ulcers, and approximately 16.5 per cent. of the gastric cancers, gross hemorrhage had occurred postoperatively. In 6 patients hemorrhage occurred within four

weeks following laparotomy.

Signs of Digestive Malfunction. Less than one-third of the patients exhibited gross physical evidences of digestive anomaly. Of 68 patients whose blood was examined, in but 30.8 per cent. was the hemoglobin below 80 per cent. There was nothing especially noteworthy in the blood counts. Rather more than 10 per cent. of the patients were definitely cachectic. This is not remarkable, when it is recalled that there were 12 cases of hopeless gastric cancer in the series. Jaundice was distinctly present in 11 cases (4.03 per cent.). In 5 patients there was malignant disease involving the pancreas, gall tract, or liver. In the remaining 6 cases, postoperative adhesions, perforated ulcer involving the pancreas, gall-stones, and biliary cirrhosis explained the jaundice. Visible abdominal peristalsis was observed in 19 patients (6.9 per cent.). It seemingly resulted from gastric hypermotility associated with stenosis in the jejunum as a consequence of adhesions, or imperfect surgical maneuvers.

In the patient upon whom gastro-ileostomy had been performed, distention and billowing of the abdomen were striking. Fecal vomiting was a daily event. Abdominal tenderness was recorded in 82 patients (30.0 per cent.). Tenderness appeared to be commonly due to gastric hyperesthesia (diffuse gastritis?); recurrence of ulcer; gastric cancer; gaseous distention of the stomach or jejunal loop; and, in 2 instances, to jejunal ulcer. Abdominal ridge or mass was observed in 44 cases (16.1 per cent.). Of these, there were 11 patients affected with gastric cancer. In the remaining cases the tumor was apparently produced by persistent abdominal wall scar, adhesions of the viscera to the parietal peritoneum, local peritonitis about the operative field, exuberant scarring at the side of the gastro-enterostomy or the point of gastric resection, persistent ulcer scar, enlarged pancreas, inflamed lymph nodes and rolled up omentum. In one case a Murphy button had become partly detached and was fixed just beyond the gastrojejunal stoma.

Observations upon the size or capacity of the stomach were made by the air inflation method in 179 cases. It is recognized that such a method is only relatively accurate. However, the air inflation is as reliable as are other procedures. An air bulb of $1\frac{1}{2}$ ounces (water capacity) was used. The average capacity of the normal male stomach was considered as 33 ounces, and that of a normal female stomach as 27 ounces, as demonstrated by me from the examinations of 7042 individuals in 1914. In 47.4 per cent. of the gastro-enterostomized patients the gastric capacity was below normal, in 20.6 per cent. larger than normal, and in 31.9 per cent. not appreciably changed. These facts are of value because it has been generally presumed that gastro-enterostomy brought about definite reduction in stomach size as a consequence of its "drainage" effect. Dietetic regimés have not often been based upon this supposition. It is, therefore, interesting to note that despite pyloric resection being associated with gastro-enterostomy in 10.59 per cent. of the cases, less than one-half of the stomachs appear to be below normal capacity. The factor of rapid escape of air through the gastro-enterostomy stomach, or through this and the pylorus contributing to an apparent increased capacity of the stomach, does not appear to warrant serious consideration. It is demonstrated by the fluoroscope and by test-meals that a sphincter-like arrangement commonly exists at the gastro-enterostomy stomach as well as the pylorus, and that air inflation tends rather to close the gastro-enterostomy stoma than to force it open; that is, provided the stomach is not greatly over-inflated. Air inflation rarely results in dilatation of the jejunal loop.

Test-meal Observations. The emptying of the gastro-enterostomized stomach was estimated physiologically, i. e., the patient was permitted to eat a full meal of foods that he liked, with the proviso that meat, lettuce (or celery or raisins), were included. The stomach was emptied after eight hours by a large-caliber stomach-tube and afterward lavaged with two liters of warm water in order to avoid retention of food bits. Of 262 patients in this series whose stomach-emptying rate was examined, persistent food stagnation, as above defined, was demonstrated in 43, or 16.4 per cent. It was present in 10 of the 12 cancer cases in the series. Gastric hypersecretion, i. e., the recovery of more than 150 c.c. of contents following an Ewald meal, was proved in 29 cases, or 11.06 per

cent.

Of the entire series the average quantity removed from the stomach was, for stagnation cases, 347 c.c., and for the non-stagnation cases 126 c.c.

Nearly one-third (30.5 per cent.) of the gastric extracts were uncolored except as the shade varied with the test-meal given. In 11.8 per cent. of meals, discoloration resulted from food remains, cell detritus, bacterial or ferment action and possible altered bile or blood.

Macroscopic blood was present in 10 per cent. of the stomach contents.

It was apparently of traumatic origin.

Observations upon the Gastric Acidity. Inasmuch as numerous workers, particularly Bolton and Paterson, have emphasized the importance of hydrochloric acid in the causation and the healing of peptic ulcer,

comparison has been made between the test-meal findings respecting

acidity before and after gastro-enterostomy.

There occurred no postoperative decrease in free HCl in 14 per cent. of cases, and that in 5 per cent. there was a definite increase. There was a demonstrable reduction in free HCl in 81 per cent. of all cases examined. This reduction averaged 20.5 per cent. The reduction in free HCl was greatest soon after operative procedures and there was a steady diminution in the degree of acid reduction in direct proportion to the time interval following operation. The greatest average reduction (37) was recorded in those cases exhibiting "vicious circle."

Respecting Total Acidity. No postoperative reduction in total acidity occurred. It averaged 21.02. The greatest degree of reduction occurred soon after laparotomy. In general, this degree became less pronounced as longer time intervened between operation and reëxamination. Cases exhibiting "vicious circle" showed a total acidity reduc-

tion averaging 28.

The above facts demonstrate clearly persistent reduction in both free HCl and total acidity following gastrojejunostomy. If excessive concentration of free HCl is an important factor in the production of, and the prevention of, healing of peptic ulcer, then it might be assumed that gastroiciumostomy, properly used, holds valuable therapeutic possibilities. What effect upon the reduction of acidity and toward the healing of peptic ulcer bile (noted macroscopically in 57.7 per cent. of this series and chemically proved to be present by Goodel's test in 47 per cent, of 182 meals analyzed) exerts, is open to question. Paterson, in rather indefinite research, stoutly maintains that bile (mixed with pancreatic juice) is "present almost invariably in the stomach after gastrojejunostomy," and that such is present in "less than 10 per cent." He states that the reduction in total acidity averages 30 per cent. and that this is "partly due to neutralization of free hydrochloric acid by bile and pancreatic juice, and partly to earlier stimulation of the pancreatic secretion and compensatory earlier lessening of the gastric secretion." Paterson also states that after gastrojejunostomy there "is an almost constant increase in the mineral chlorides of the 'gastric contents' and, as a rule, a diminution of the total chlorides." The "increase" in the mineral chlorides disappears "after undoing a gastrojejunostomy." He claims that the average increase in the mineral chlorides is 0.077 per cent., and that such increase to the stomach comes through the anastomotic opening.

It would seem, according to Paterson, that this increase in mineral chlorides is an important factor in reducing gastric acidity, and thus aiding ulcer healing. However, Panton and Tidy maintain, as a result of much painstaking research upon the value of various methods of gastric analysis, that there is no really reliable technic by which mineral salts (chlorides, phosphates) can be accurately estimated in gastric contents. They assert that, in low acidity cases, the amount of phosphates present is probably independent of the clinical condition, and that phosphates introduce a "fallacy" common to all methods investigated. Further, that when free HCl is low or absent, the "active

hydrochloric acid" is overestimated because the fixed chlorides interact with phosphorous compounds, with the consequence that the phosphates are increased. Panton and Tidy also suggest that phosphates in excess are secreted into the gastric cavity, when the stomach mucosa fails to elaborate free HCl from the mixture of phosphates and chlorides brought to it from the blood. It would thus appear that Paterson's opinion respecting the source of increased mineral chlorides in gastroenterostomized stomachs is open to question, and that even the increase which he maintains exists (0.077 per cent.) is well within the possibility of chemical error.

Hamburger has recently confirmed the work of Schutz and Levites with reference to the inhibiting action of various alkaline salts on peptic digestion. He claims that such alkalies definitely inhibit peptic digestion, and, in a later communication with Halpern, suggests that inasmuch as phosphates, chlorides and carbonates inactivate pepsin, a therapeutic advantage in the cure of peptic ulcer can be secured by their use. Inasmuch as it seems evident that phosphates (and perhaps chlorides) are increased in gastro-enterostomized stomachs as free HCl is decreased. it would appear that the experiments of Hamburger and Halpern might explain some of the beneficial effects of gastro-enterostomy toward ulcer cure. It is still unsettled whether bile and pancreatic juice contain "antipepsin" when regurgitated into the stomach. Bile was present in 9.5 per cent. of the gastric contents from 140 non-stenosing ulcer cases that he analyzed, and yet two-thirds of the ulcers lay in the pyloric fourth of the stomach where they could secure the maximum benefit of bile regurgitation should it contain "antipepsin."

Altered blood was demonstrated in 42.5 per cent.; lactic acid in 3.4 per cent. (mainly the cancer cases), and volatile fatty acids in 2 per cent.

(also the cancer cases).

Wolff-Junghans's test for soluble albumin was negative in nearly three-fourths of the cases.

Formal index demonstrated a slight increase over the ereptic power common to peptic ulcer, but no increase over that observed in cancer.

It averaged 14.2 per cent. in 81 cases analyzed.

Macroscopic examination of gastric extracts exhibited nothing characteristic. In the benign stagnation extracts, yeasts and sarcinæ were often abundant. In the malignant retention extracts, organisms of the Oppler-Boas group were plentiful. Regurgitated bile and pancreatic juice appear to have no effect upon the gastric flora. In 5 cases in which stagnation existed in the jejunal loop, the presence of a peculiar, short, fat, deeply-staining, acid-fast bacillus appeared constant. When it had been observed several times, its presence in large numbers led to the diagnostic suggestion that jejunal stenosis with dilatation might be present, which suggestion was substantiated at laparotomy.

Stool Analyses. Altered blood was demonstrated by the benzidin test in 31 of 107 cases studied. Of these, 72 patients were upon the

test-diet.

To 28 patients Schmidt's test-diet was given. In 17 cases (60.7 per cent.) there was evidence of deficient proteolytic digestion.

Bile pigment (Schmidt bichloride method) was present in all but 8 of 151 stools examined, either as hydrobilirubin or biliverdin. In 7 instances where bile pigment was absent, there was deep jaundice. In the remaining case there existed intestinal obstruction and pronounced cachexia (instance of gastroileostomy).

Roentgen Examination. Fluoroscopic study was made of 39 cases within seven weeks of gastro-enterostomy and of 26 cases operated upon from six months to nine years previously. The results were so greatly at variance with the patient's physiologic digestive function or his clinical condition that we are still in doubt as to clinical worth of the

procedure.

Oxygen Treatment for Gastric Disturbances. San Martin and Barillas⁵³ discuss the treatment of gastric disease with oxygen insufflations. By means of a stomach-tube and a generator they insufflate oxygen into the organ, and in forty-eight hours there is a suppression of pain, hypersecretion, and pylorospasm. The beneficial effects are most plainly evident in long-standing gastric disease, rebellious to ordinary measures. The oxygen insufflation into the intestines, it will be recalled, was advocated by Schmidt.

Gastric Ulcer. Carro⁵⁴ mentions the use of diathermy in the treatment of ulcer. In 3 cases improvement occurred only after thermopenetration. These were old cases. This treatment is supposed to inhibit acidity. In another case of ulcerative colitis of the dysenteriform type, improvement occurred. Carro used 1 to 1.5 ampères, never goes above 2.5, and gives daily sittings of twenty to thirty minutes. In the case of ulcer, eight to twenty sittings are given.

DISEASES OF THE DUODENUM.

Transduodenal Lavage. Jutte⁵⁵ declares that indications for transduodenal lavage are exceedingly wide. Besides ailments of distinctly intestinal origin, such as ptomaine poisoning, indicanuria, typhoid fever, diarrhea, enteritis, colitis, "gas," worms, many others less obviously dependent upon the gastro-intestinal tract come within its scope. Among these conditions already satisfactorily treated with transduodenal lavage are; primary and secondary anemia, goiter, rheumatism, gout, arthritis, bronchial asthma, chronic catarrh of the respiratory tract, certain eases of high blood-pressure, biliousness and other liver and gall-bladder diseases, pancreatitis, general malaise, melancholia, neuroses, neuritis and insomnia.

"The technic of transduodenal lavage is as follows: Prepare 1000 c.c. of the lavage fluid and suspend the container about 6 feet from the ground. Force a little glycerin into the duodenal tube with the hypodermic syringe and insert the obturator to the bottom of the hollow stem of the sinker. Protect the patient's clothing with a rubber apron, and let him be seated comfortably in a chair. If he is sensitive, spray his

Vida Nueva, Havana, April, 1918, No. 4, p. 137.
 Medicina Ibera, Madrid, March 14, 1918, ii, No. 19.
 Medical Record, September 22, 1917, p. 500.

throat with 1 per cent. cocaine solution. Explain to him the steps you are going to take. Take hold of the tube about 6 inches from the end, place its tip on the back of his tongue and tell him to swallow once. This opens the pharynx and allows of thrusting the tip of the tube over the back of his tongue; then, while he breathes audibly and takes occasional draughts of water, gently push the tube little by little into the stomach. When down the esophagus a few inches, it is well to hold on to the obturator and to slide the tube along it until introduction is finished, when the obturator is withdrawn entirely. With care, there is

no gagging or appreciable discomfort.

"Let him lie down on the couch on his right side. The weight of the sinker and peristalsis, stimulated by the water taken, carries the tube almost at once into the duodenum. Adjust the proximal end, which carries the glass tip, to the suction bottle and aspirate with the metal syringe. As long as the tube is still in the stomach, only fluid of watery consistency comes up. When the pylorus is passed, the return fluid begins to flow like syrup, i. e., it draws out into a thread, owing to the admixture of duodenal secretion. As the fluid flows or drops down into the bottle, the change from watery to syrupy consistency is easily seen. The author has found this simple working-test for locating the tube perfectly reliable hundreds of times; no x-ray is required. At times fluid of gastric origin comes up bile-stained, and may for that reason deceive the operator. At other times, duodenal secretion is abnormally thin in consistency and flows almost like water. When in doubt, it is well to try to stimulate peristalsis by letting the patient drink more water or to force about 2 or 3 ounces of water through the lumen of the tube. If, after five minutes, still no syrupy fluid is returned, the tube may safely be regarded as having entered the duodenum; usually this occurs within two minutes. In hyperacidity, the drinking of half a glass of water with half a teaspoonful of sodium bicarbonate dissolved in it, will quickly relax spasm. The patient then sits up in a chair next to the irrigator stand and is given 2 or 3 ounces of milk with crushed crackers to drink; this causes the pylorus to contract and close in upon the duodenal tube, and prevents a backflow of any lavage fluid into the stomach. Adjust the leader of the container, after draining the cooled-off fluid, to the duodenal tube in such a manner that the connecting glass tip points upward. This regulates the flow and prevents the fluid from running in too fast. The rate of flow should be a quick drip, the amount about $1\frac{1}{2}$ to 2 pints, and the time consumed in running in from five to ten minutes.

"The rate of drip may be further regulated by occasionally turning the stopcock for one-half to one minute. This should also be done if the patient has a sensation of fulness. Very soon after beginning the lavage the patient is liable to become conscious of peristalsis, and to feel or hear fluid and gas passing onward; there is no griping or discomfort at this or any other time. When all the fluid has entered the duodenum, the patient is given a basin to hold and the tube is very gradually withdrawn. He can now have his breakfast in from half an hour to two hours he has from one to three fluid, easy movements, which leaves him relieved

and refreshed. The whole treatment takes from fifteen to twenty minutes. Sometimes useful information may be obtained by testing the

aspirated fluid with litmus and congo-red paper.

"The frequency of treatment depends on the severity of the case. In very severe cases it may be given once daily for up to ten to twenty days, then two or three times a week for one to three months; in the average case two or three times a week for about one month and thereafter at rarer intervals; sometimes once a week is sufficient. Each case should be treated individually, the endeavor being first to establish normal conditions in the bowel and then to maintain them by an occasional treatment until such a time as nature needs assistance no longer."

Duodenal Ulcer. Diagnosis. Fortmann⁵⁶ comments on the clinical diagnosis of duodenal ulcer. Nervousness and loss of weight were prominent symptoms. He mentions one patient who correctly diagnosed his own case from a "doctor's book." He advises that the patient refrain from meat for ten to twelve days before trying the occult blood reaction. Hyperacidity is the rule, but anacidity has been encountered by Stierlin and himself (Crispin). 'The practitioner may find Friedreich's swallowed thread-test instructive. He always found hunger-pain, night-pain and periodicity of the pains spreading toward the liver region and back. The tender point in two or three fingers breadths to the right of the midline: in 1 of 4 cases described in detail, the tender point was on the left. A second tender point is sometimes found at the tip of the twelfth rib on the right, posteriorly. Vomiting of blood may occur with duodenal, as well as gastric, ulcer. The disease even occurs at advanced age, one of his patients being sixty-three years. When stools and roentgen findings are negative, the individual may be a so-called "duodenal ulcer neurasthenic."

DUODENAL ALIMENTATION IN THE TREATMENT OF ULCER. Pages and Ibanez⁵⁷ revive the question of duodenal alimentation in ulcer treatment. They describe 4 typical cases out of 72 cases in two years. They introduce the tube at night and feed with 150 gm. of tepid milk daily, then 200 grams, but never up to 300 grams, as this amount cannot be borne with comfort (I have used the Murphy drip system, using large amounts with comfort). Yolks of eggs are given up to four a day, followed by a saline injection. The relief of pain is the first point noted. Success, it is claimed, was noted in all but 2 cases, 1 of pyloric stenosis and the other of Reichmann's disease. With inoperable gastric cancer, some of the patients are relieved of pain and discomfort by this method, but in others it not only failed to relieve pain, but brought on gastric hemorrhage, sometimes fatal. It is the last point which is the most likely to militate against the use of duodenal feeding. The method is not difficult, but it is not by any means as palatable as one would suppose.

In my experience, its long emplacement in the duodenum is liable to induce gastric hemorrhage or hypersecretion. This method of treatment

^{**} Correspond.-Blatt. f. Schweizer Aerzte, October 6, No. 40, xlvii, 1349.

⁵⁷ Abstract of Journal of the American Medical Association, 1918, No. 21, vol. lxx, p. 1576; Vida Nueva, Havana, April, 1918, No. 4, p. 132.

is undoubtedly of great value in selected cases, but it is my opinion that its principal value lies not in the ulcerated cases, but particularly in those which are not ulcerated. This question is still an unsettled one, as well as the composition of the material for feeding purposes.

TREATMENT. Bastedo⁵⁸ claimed that the treatment of duodenal ulcer differed according to whether the patient was in the phase of severe hemorrhage or not. He recommended the following measures for

hemorrhage:

(1) To secure physical and mental quiet by having the patient lie flat without a pillow, and with an ice-bag over the epigastrium, and by the administration of morphine, which allayed restlessness, diminished the chances of vomiting, took the tone from the general stomach muscles, induced closure of the pylorus, and thus assisted in keeping the duodenal ulcer region free, for the time being, from gastric contents. (2) To give nothing by mouth, not even a teaspoonful of water or cracked ice. (3) To allay thirst by the rectal administration of a pint or two of warm saline solution. If the patient was exsanguinated, 1000 or 1500 c.c. of normal saline by hypodermoclysis or venous infusion might be administered, or best of all, if it was feasible, a transfusion might be done. If the hemorrhage appeared to be continuous, one might inject subcutaneously. every six hours for three doses, 20 to 30 c.c. of human or rabbit serum, or intravenously 20 c.c. of a freshly prepared 10 per cent. solution of normal saline coaguler or coagulose. It took the serum six to twelve hours to affect hemorrhage. One might employ subcutaneously or intramuscularly, but not intravenously, a like amount of a 10 per cent. saline solution of thromboplastin. The calcium salts were probably of little if any value. As a rule, surgery was not indicated at a time of hemorrhage from a duodenal ulcer, because usually the hemorrhage ceased spontaneously or as a result of the measures taken.

The subsequent treatment was to continue the quiet of the patient, keeping him in bed; allowing nothing by mouth for three days, and allaying thirst by rectal salines, $\frac{1}{2}$ to 1 pint every four hours to every eight hours, or by the Murphy drip, giving $2\frac{1}{2}$ to $7\frac{1}{2}$ ounces per hour; cleanse the bowels by daily enema; giving a nutrient enema two to three times in twenty-four hours; keeping the mouth clean with peroxide of hydrogen or simple mouth washes, and, after the end of three days, treating

the same as for ulcer when there is no hemorrhage.

As to the treatment of ulcer at the time when there is no severe hemorrhage, if the case is definitely surgical, there was no use in wasting time on the medical treatment. Bastedo stated that he considered the treatment if there was acute perforation; if there was chronic perforation, as demonstrated by the roentgen rays; if there were adhesions, as demonstrated by the roentgen rays; if there was pyloric obstruction; if there was suspicious carcinomatous change; if there was, in spite of the proper medical treatment, repeated copious hemorrhages, or persistent hemorrhage in small amount; and if there was constant pain or nausea or interference with nutrition.

In a discussion of the roentgen diagnosis of early gastric cancer before the New York Academy of Medicine, William Stewart⁵⁹ described the

appearance of gastric cancer.

It was not always possible to make an early diagnosis of carcinoma of the stomach as many cases did not present themselves until the process was well advanced. Those who sought advice early presented fairly typical x-ray findings. It was recognized that gastric cancer appeared in the forms of a true tumor growth of the stomach wall, a scirrhus or

infiltrative type and an ulcerative form.

The difficulty of diagnosing the first was not great. The x-ray findings were characterized by a circular or irregular defect in the stomach outline. If located at the pylorus, the defect had a "punched-out" appearance, while if located on the anterior or posterior wall of the stomach the patient had to be turned. In the scirrhus form there was stiffening and thickening of the stomach wall, with marked contraction and diminution in size, and there was partial or complete absence of the peristaltic waves through the entire area. Under the fluoroscope, the contraction passing toward the pylorus from the fundus diminished or disappeared entirely to again appear beyond this area, if there was normal stomach wall between the diseased portion and the pylorus. It is in the third, or ulcerative, form that the greatest difficulties presented themselves. Since it must be conceded that the presence of carcinomatous tissue in an early ulcer could only be ascertained by the microscope, they had a large number of cases between a typical carcinoma and an unquestionable benign ulcer in which the diagnosis of malignancy was doubtful. He mentioned, furthermore, the difficulty in the differential diagnosis of gastric syphilis. Le Wald, in discussing the paper, exhibited the similarity of gastric syphilis. The differential points, however, were the growth in certain patients and the positive Wassermann reaction.

DISEASES OF THE LARGE AND SMALL INTESTINES.

Gastric Troubles of Intestinal Origin. Faroy,⁶⁰ under the heading of false gastric disturbances of intestinal origin, contributes an article on the association of gastric symptoms with true colon disturbances. It will be recalled that Mathieu called attention to that association in his "Pathologic Gastro-intestinale." The author presents the following observations:

Clinical Study. The patient presents himself with gastrie symptoms; it is, to use the words of the author, "the stomach which suffers." The appetite is variable, discomfort and distention occur after eating. There are associated reflex respiratory (more or less marked dyspnea, sensations of oppression), or circulatory (tachycardia, redness of the face, vasomotor signs), or nervous symptoms (postprandial narcolepsy). Frequently there will be painful gastric attacks, with occasionally nausea, more rarely vomiting. Cramps in the neighborhood of the epigastrium, with even a sensation of burning in the lower end of the esophagus due

Report, Medical Record, July 21, 1917, p. 124.
 Presse Médicale, May 30, 1918, p. 271.

undoubtedly to the regurgitation of acid through the esophagus. Painful contraction of the cardia, sialorrhea, insomnia with drowsiness after meals. Occasionally there is agitation and nervousness, and, through the day, headache, general fatigue, lumbar pains, intellectual torpor,

all of which will seem to point to the stomach.

Objective Symptoms. These are usually few, possibly aerophagia, atonicstomach, delay in evacuation, but there is almost always one tender point in the epigastrium. On examination of the lower abdomen, however, a frequent and important point is the tender contracted cord of a spastic descending colon and sigmoid. Frequently this is associated with a spastic, palpable and tender transverse colon. The movements may be regular, but they are usually difficult and insufficient, and the constipation occurs at intervals, separated by periods of diarrhea. In many cases further investigation elicits the fact that there are frequent mucoid movements, and mucomembranous colitis is present. In other cases, the movements are insufficient, soft, pasty, with intimately mixed mucus, and of the type of mucous enterocolitis. The important point regarding these forms is the fact that they have a tendency to conceal themselves ("leur effacement"), and still the gastric symptoms are very prominent.

The gastric manifestations evolve in two different ways: (1) A discontinued form in which, from time to time after a certain meal, the symptoms will appear, (2) the continued form in which the gastric phenomena remain for long periods of several weeks, or more. It will be recalled that the intestinal condition manifests itself by constipation punctuated with diarrhea, and it is usually preceding the diarrhea and

accompanying it that the gastric symptoms appear.

Regarding the pathology of this condition, it is based, according to our present conception, on reflex nervous action. In fact, certain authors group them under the head of disassociation of the autonomic system, and Loeper distinguishes the two vagotonic and sympathicotonic types, whether we call it a neurosis, or a vagotonia or sympathicotonia, or the more elaborate enteroceliogastric neurosis of Loeper; the essential point is that the precise etiological factors are still in the dark. Loeper speaks of inflammatory and toxic causes.

In the treatment of this condition, we seek to produce regular bowel action. Castor oil and sulphate of soda in small repeated doses are the laxatives recommended. The bicarbonate, sulphate, and phosphate of soda, in the form of the so-called Bourget's solution, may be used. Heat to the abdomen and antispasmodics of the belladonna group are of great value. Dietetic treatment is indicated, but the author does not discuss in detail the diet best suited to these conditions.

This subject is an important one, and in my experience these cases are very frequent. In fact, most American text-books fail to emphasize or satisfactorily describe this condition, which is extremely common.

Vaccine Therapy in Certain Forms of Chronic Enteritis. Berthelot⁶¹ discusses the technic of autovaccine therapy in the treatment of certain

forms of enteritis by employing a true amino-acidolytic and proteloytic microbe. As the technic is difficult, I am giving almost a literal translation:

1. Isolation of the Amino-acidolytic Organisms. This method is based on a method exposed by the author in which the media employed in isolation of the organisms contained simply an amino-acid, $\frac{1}{2}$ gram per liter, as the sole organic constituent. However, the formula can best be made as follows:

								1.50 grams
Pure crysta: Amino-acid								
	٠							
Water .								1000 "

Heat five minutes at 120° F., filter and sterilize thirty minutes at 115° F.

The amino-acids used are practically four: Alpha alanine, tryptophan, tyrosine, and histidine. They should be obtained by the hydrolysis of proteins and rigorously purified. They should then be distributed in 10 c.c. portions in test-tubes, and should be inoculated with very small quantities of fecal matter. In the first tube simply a small amount covering several millimeters of the extremity of a platinum needle should be inoculated, sufficient to produce a very slight bacterial cloud on the surface of the medium. For the three remaining tubes employ a small platinum loop with $\frac{1}{2}$ mm. interior diameter. The inoculated tubes should be maintained at 37° . For the amino-acidiolytic organism, that one is selected which gives the predominating culture in the fourth tube. These may be definitely isolated on agar slants prepared with the above nutritive formula or vegetable broth (bouillon de legumes).

2. Isolation of the Proteolytic Organism (Predominating). Inoculate at the same time several gelatin plates, a series of Veillon agar tubes, several tubes of milk (with and without boiling), several anaërobic tubes of meat-broth or white of egg coagulated in suspension in a nutritive mineral solution. To search for the proteus, inoculate the water of condensation in an ordinary inclined agar tube. The pyocyaneus frequently invades the amino-acid solutions, rendering the isolation of the amino-acidolytic organism difficult. The choice of the particular proteolytic organism is determined by microscopic examination of the feces (Gram's stain) or (carbolic gentian violet); Lugol's solution; alcohol

acetone, diluted Ziehl's solution.

3. Preparation of the Mixed Vaccine. The two organisms selected ought to be cultivated; the aërobes on agar, the anaërobes in bouillon; the media ought to be somewhat sweetened by the addition of glucose for those organisms giving rise to spores (B. perfringens, sporogenes, putrificus), etc. In all cases he prefers the vegetable bouillon for which he gave the formula as giving organisms of diminished toxicity.⁶² The microörganisms ought to be washed by centrifugalization in physiological salt solution, and this same solution will serve for dilution. He counts

the number of organisms in the cell of a hemacytometer affecting the dilution or suspension in the following solution: conc. HCl, 2 mils.; HgCl₂, 0.2 gram, aq. dest., 100 mils., acid fuchsin in sufficient quantity to strongly color the bacteria. The count and determination of the grade of dilution is thus extremely simple. In this way an emulsion is prepared and the organisms prepared in small ampoules and sterilized by heating at 63° to 65° for forty-five to sixty minutes. Sterilization is verified by inoculating into agar and bouillon and examining after twenty-four and forty-eight hours. The anaërobes should be verified by inoculation, and a sojourn of four days in the incubator at 37°.

4. Doses and Method of Employing: He injects the vaccines always in the subcutaneous tissues of the flanks, or the subspinous region. The dose is largely fixed according to the clinical manifestations and the

type of bacteria encountered.

The beginning doses should be somewhat as follows:

B. coli group, 5 to 10,000,000.

B. lactis aërogenes group, 3,000,000.

B. dysenteric group, 1 to 3,000,000. B. perfringens, 5 to 20,000,000.

B. sporogenes, B. putrificus, 1 to 3,000,000.

Proteus vulgaris, 3 to 10,000,000. B. pyocyaneus, 5 to 10,000,000.

The two vaccines are mixed in a syringe and the minimum dose necessary to determine an intestinal reaction is given. The doses are then given at five- or six-day intervals, augmenting the doses each time from 50 to 100 per cent. Only the observation of the patient, however,

will permit determining the exact dose to be employed.

5. Indications and Contraindications of Vaccine Therapy in Chronic Enteritis. It is to be recalled that in many cases there are other definite causes interdicting the use of vaccines. Parasitic enteritis, amebiasis, tuberculosis, syphilis, neoplasm, mycosis, appendicitis, hepatic, gastric, renal or pancreatic disturbances inducing the disease. Disturbances in ductless gland function, adnexial disturbances, pyorrhea, postnasal and throat disturbances, uric and oxalic diathesis, colitis and sigmoiditis due to stasis with, or produced by, adhesions; all of which are capable of inducing chronic enteritis. But apart from these and those benefited by the administration of the various gastric, hepatic, pancreatic, and intestinal extracts, intestinal lavages and the various hydromineral cures, the rest are usually due to bacterial disturbances. In every case, the above possibilities must be ruled out.

Never practice vaccination in the presence of an acute exacerbation, always employing the smallest reaction without inducing a local reaction. Finally, never inject these vaccines unless their sterility has been rigor-

ously controlled.

Combined Vaccination with Multiple Vaccines. Vastellani and Taylor⁶³ have used multiple vaccines for inoculation and their methods are sufficiently interesting to stimulate further investigation.

⁶³ British Medical Journal, London, September, 1917, p. 356.

These methods might profitably be used in intestinal disturbances, in fact I have used this method in those conditions for several years.

These authors use a series of vaccines: Tetravaccine No. 1 (T.A.B.C.) consists of four standardized emulsions mixed in equal proportions and each cubic centimeter containing 500 million typhoid, 250 million paratyphoid A, 250 million paratyphoid B, 2000 million cholera. Of this mixture, 0.5 c.c. is given under the skin of the arm the first time, and the same, or double that amount, the week later. Tetravaccine No. 2 (T.A.B.M.) consists of an emulsion in phenolized saline solution (phenol 0.5 per cent., salt solution 0.85 per cent.) of B. typhosus, B. paratyphosus A and B, Paratyphosus B, and N. melitensis. After standardizing and testing their sterility, they are mixed together in equal parts. The vaccine will contain, per cubic millimeter: Typhoid, 500 million; paratyphoid A, 250 million; paratyphoid B, 250 million; malta fever, 2000 million; 0.5 c.c. of this vaccine is injected in the arm and a week later the same or double the amount is given.

Pentavaccine No. 1 (T.A.B.C.P.) consists of a phenolized saline solution of typhoid, paratyphoid A and B, cholera vibrios and plague bacilli. It contains the same number of the former organisms plus 2000 million cholera vibrios and 500 million of B. pestis. 0.5 c.c. of the vaccine is given at the first dose and twice that quantity a week later. Pentavaccine No. 2 is so standardized that each cubic centimeter contains typhoid, 500 million; paratyphoid A, 250 million; paratyphoid B, 250 million; cholera, 2000 million; malta fever, 2000 million. The same

doses are given.

Hexavaccine (T.A.B.C.P.M.) consists of an emulsion in salt solution of B. typhosus, paratyphoid A and B, cholera, B. pestis, and M. melitensis. The combined vaccine is standardized so as to contain B. typhosus, 500 million; 250 million each of A and B paratyphoid, 2000 million of cholera, 500 million of B. pestis; 2000 million of M. melitensis. Exactly the same doses are given as in the foregoing instances. The authors point out the harmlessness of the vaccines. The reactions are not severe except those containing the plague organisms, and even the simple monovalent plague vaccines give a strong reaction. It is essential that in selecting the strains they be rich in antigen. This is especially the case in B. paratyphosus and M. melitensis, poor antigens giving a poor antibody output.

This method of multiple vaccines is of the greatest value, especially in immunizing troops. That this can be done harmlessly is here demonstrated and the possibilities are far-reaching. To protect troops against typhoid, paratyphoid A and B and cholera with ordinary monovaccines would require at least eight inoculations when it can be done in two.

I have been interested in this subject for a long-time and have repeatedly inoculated individuals with vaccines containing as high as six and seven strains without untoward effects, and often markedly beneficial results.

Occult Blood in the Stools of Pulmonary Tuberculosis. Lange⁶⁴ examined the stools on four occasions at one-day intervals in 37 cases of pulmonary

⁶⁴ Ugeskrift for Laeger, Copenhagen, August 16, 1917, No. 33, p. 1371.

tuberculosis in their first stages; 25 in the second stage; and 64 in the third stage. Of these cases, 1 of the first group, 3 in the second group, and 10 in the third group, showed signs of bowel tuberculosis. He also applied the same test to 34 cases of intestinal tuberculosis as shown by clinical and postmortem findings. The occult findings were negative in all of the first group, 3 out of the second group were positive, while in the 64 of the third group, 4, of the 10 which showed intestinal tuberculosis. gave a positive reaction. In the 34 cases of bowel tuberculosis, the findings were positive in all but 3. Among the practical results of this study are: (1) The fact that intestinal ulcerations might exist for a long time without giving rise to bleeding; (2) that tuberculous intestinal conditions are more commonly associated with pulmonary tuberculosis than would be supposed from the clinical findings of the case. This subject is naturally an important one because the question will frequently arise in the clinician's mind as to whether intestinal tuberculosis can be recognized, or at least suspected, by a positive occult reaction in the stools. This is the case in advanced lesions; needless to say, in the above studies the proper precautions regarding a meat-free diet was observed.

Fecal Analysis in Chronic Enteritis. Goiffon⁶⁵ discusses the value of careful fecal analysis in the interpretation of various intestinal conditions found in the troops. These methods were employed under his direction in a special section devoted to diseases of the intestinal tract, and is given in considerable detail, because of its direct value from a military standpoint. The following headings are considered: Inflammation of the small intestine; hepatic and pancreatic troubles; chronic typhlitis; the diarrheas of fermentation; mucous colitis; left-sided colitis and sigmoiditis; intestinal ulceration; the parasitic nature of certain forms of colitis; the gastric nature of certain forms of enteritis, and the enteric nature of

certain forms of gastric disturbances; finally, malingerers.

1. In small intestinal inflammation, two forms of stools occur, in the lighter cases the material is yellowish-red, of a faded and penetrating odor, dysenteric, adhering poorly to the glass, dissolving easily in water, containing muscle fibers poorly digested, fat globules, and starch. The sublimate reaction gives a green color due to unconverted bilirubin; the reaction to litmus is alkaline. If the mucosa is more irritated, the movements are liquid, containing little floccules, with many bacterial colonies, while the food digestion is the same as that described.

2. Pancreatic and hepatic troubles, the author claims, have not increased in frequency since the war. They are recognized by the abundance of fatty acids, and the absence of bile pigment, in cases of hepatic insufficiency; the presence of an abundance of neutral fats, of biliary pigment, undigested muscle and starch, in the case of pancreatic insufficiency.

3. Chronic typhlitis is usually a sequence of old appendicitis, various intoxications, typhoid fever, parasitic or microbic infections, the localization of the pain, palpation, and the x-ray form the elements of diagnosis. Fecal examinations will demonstrate cecal stasis, this is based on the fact, first, that it is principally in the cecum that the digestion of starch takes place; second, irritation of this portion of this membrane

provokes an exudate of mucous liquid, or nucleoalbumin, which favors putrefaction. This liberates various alkaline products, such as ammonia, as well as aids in the form of volatile acids, through fermentation. These media are very favorable to the multiplication of certain protozoa. The movements can be soft, or even diarrhea, and show a diminution in fecal amylase and in the amount of volatile acids. Movements, when loose, are frequently black, viscid and alkaline, with putrid odor; quite frequently the tetramitus, trichomonas, and the ameba coli are found.

4. Diarrheas of Fermentation. Fermentation of carbohydrates, while normal in the cecum to a certain degree, can be markedly exaggerated, so that the acid products formed can irritate the colon and provoke diarrhea. The movements are characteristic—yellow, spongy or foamy, acid to litmus, sharp odor, containing considerable undigested starch, and iodophilic bacteria. Apparently, from the author's statement, this

form of diarrhea has been met with quite frequently.

5. Mucous colitis, which is well known, is probably the most frequent, consisting of pasty, mucous stools, homogenous, yellow-looking as if they had been varnished, the mucus, however, is most frequently intimately mixed with the movement, and there is considerable undigested starch, owing to the too rapid evacuation of the large bowel. These are the cases in which there is frequently associated an old dysenteric infection.

6. Left-sided colitis and sigmoiditis—constipation alternating with diarrhea, or diarrheic attacks, hard movements or scybalous masses also covered with mucus, occasionally a false diarrhea—will occur with soft,

brown, dysenteric movements.

7. Intestinal Ulceration. Pus, blood and serum albumin are the signs of this condition. If these are fresh, and not mixed with fecal material, it can be concluded that the lesions involve the lower sigmoid and rectum. If the movements are pasty and liquid, and microscopical examination shows beside the pus, blood, or mucus, the presence of substances such as starch, cellulose, and iodophilic bacteria, the inference is that the condition involves the upper bowel. This differentiation is extremely important from a therapeutic standpoint, inasmuch as the lower colon lesion involving the sigmoid and rectum can be treated by medicated

enema and direct application.

8. Parasitic Forms of Enterocolitis. Under this heading Goiffon points out the necessity for the careful examination of the movement which he says, rightly, is but rarely done, in spite of the fact that this war has shown the frequency of the affection (amebic dysentery). One soldier was moved from hospital to hospital before it was discovered, another teacher was actually operated on for a supposed cancer of the sigmoid before it was recognized that ameba were present, a two-weeks treatment with emetine resulting in a cure. Intestinal parasites by no means always give rise to diarrhea. Amebic dysentery was frequently encountered, showing both the cysts and the active organisms. The lamblia intestinalis existed before the war, but has increased in frequency since then. For instance, they encountered 30 cases in two years. The syn-

drome of chronic appendicitis has been provoked by this organism. No specific form of treatment is known. Even high doses of salicylate of bismuth are only relatively efficacious and only intravenous injections of arsenobenzol have given encouraging results. The Trichomonas hominis and the Tetramitus mesnili are flagellate frequently encountered in chronic diarrhea. They believe that they proliferate, especially when the material in the bowel is liquid and alkaline. They are to be encountered chiefly in stasis on the right half of the colon. The blastocystis hominis, extremely frequent in the movements of colitis, seems to be without pathogenic action. They are almost normal inhabitants of putrefactive stools.

9. The Enteric Origin of Certain Gastric Disturbances. Gastro-enteritis is a type of this association where the enteric manifestations may predominate. While gastric symptoms may be prevalent, examination of the colon reveals a tender, painful bowel, with possibly constipation and diarrhea alternating. Examination of the stools, however, will reveal parasites, putrefaction, or fermentation, and other evidences of intestinal

troubles.

10. The Gastric Origin of Certain Diarrheas. The feeal formula for this condition is almost too well known to merit description. The presence of connective tissue, as well as the demonstration of gastric insufficiency by intubation, will establish the diagnosis.

11. Malingerers. These are frequently of extreme difficulty to diagnose and arise chiefly through the taking of laxatives and purgatives. Phthalein, which is frequently an ingredient, is readily recognized by the

addition of soda to the movement.

Rhabdomyoma (malignant)

Fibro-adenoma . . .

Benign Tumors of the Intestines. King discusses benign tumors of the intestines, and reviews the literature of this subject, covering the fibromata, myomata, adenomata, and lipomata, especially Heurtaux's work. He mentions the fact that, out of a total of 44,654 intraperitoneal operations, benign tumors were found with the following frequency at the Mayo clinic:

Lipoma of col Fibromyoma Fibroma of m Dermoid cyst Myoma of jej Fibroma of co Retroperitone Polyposis of co Papillomata of	of mesos of rolling of	iese: igm nyse m pon	nter oid ente na	ry ery											 	1 1 1 1
A study of re	por	ted	ca	ses	of	be	nig	n t	um	ors	sh	ow	S:			
A study of re Fibroma .	por	ted	ca	ses				n t					s:			14
Fibroma .																14 17
Fibroma . Adenoma .																14 17 45
Fibroma . Adenoma . Myoma .																14 17 45 29
Fibroma . Adenoma .																
Fibroma . Adenoma . Myoma . Lipoma .						· · ·,										29 3 2
Fibroma . Adenoma . Myoma . Lipoma . Angioma .														 	 	29 3

As regards location they are distributed as follows:

Duodenum										5
Jejunum .										8
Ileum										
Small intestin										
Ileocecal region	n .									3
Appendix .										1
Colon										
Intestine (not	desi	gnate	ed)							10

King⁶⁶ states, in considering the *symptoms*, that Heurtaux divides the cases into three groups: First, the small tumors causing no symptoms, which are found by chance at operation or autopsy; second, larger tumors growing toward the serosa and causing little or no symptoms except the pressure of a tumor; third, tumors causing intestinal disturbances, which may be (1) irritative, or (2) partial or complete obstruction. In the second class of cases there may, in some instances, be an obstruction from adhesions or from the pressure of a large tumor. In the third class the symptoms vary from vague intestinal pains, "indigestion," etc., to coliky attacks, vomiting, often obstinate constipation, which may alternate with diarrhea. At times true obstruction develops, which may clear up spontaneously, may be relieved by purgation and enemata, or may require operation. Some cases are characterized by a persistent diarrhea. At times, bloody and mucoid stools are passed, especially in the case of a rectal tumor. These latter are also characterized by tenesmus, a sensation of a foreign body in the rectum, and at times the appearance of the tumor at the anus during defecation.

The diagnosis rests on the above symptoms which generally appear as follows (Heurtaux):

1. Rectal tumor, which presents at the anus or is felt in the rectum, accompanied by tenesmus, bloody stools, constipation, and sensation of a foreign body in the rectum.

2. Tumor felt on examination with mild indefinite digestive symptoms.

3. More or less grave intestinal disorders, such as partial or complete obstruction, etc., no tumor felt (usual).

4. Similar to 3, but tumor is felt (rare).

5. Tumor only, no subjective symptoms (rare).

As can be seen from the case-reports and from the tables, the most frequent complication is invagination, which occurred twelve times in Heurtaux's cases (adenoma twice, myomata seven times, lipomata three times) and eleven times in the additional cases collected by the authors. This is a rare occurrence in the case of a malignant tumor of the intestine, on account of the different mode of origin and growth of the latter. Another eventuality, in the case of pedunculated tumors (of the rectum in particular), is spontaneous rupture of the pedicle and expulsion of the tumor. Heurtaux noted this occurrence six times (myomata, three times, and lipomata three times).

Surgical Treatment of Enterocolonic Diarrhea. Gant, 67 in a concise article on this subject, discusses the whole question, preferring an etiological classification to that ordinarily employed. He would discuss it under the heading of catarrhal, tuberculous, syphilitic, gonorrheal, and amebic, bacillary, balantidic, flagellate, coccidic, and helminthic, colitis and enterocolitis. Catarrhal enterocolitis he believes will usually yield to medical treatment, but does not hesitate to use appendicostomy in difficult cases. In syphilitic cases, a necessity for radical operation often arises, and the author makes the statement that salvarsan and antispecific medication is valueless when the intestinal mucosa is extensively ulcerated or the bowel stenosed. Colonic irrigation, using 4 per cent. argyrol or 2 per cent, ichthyol solution, is recommended for gonorrheal enterocolitis. For the amebic form of the disease, the author considers that the severe forms are rarely cured without surgery, and that appendicostomy and cecostomy are of great value in that condition. Ichthyol, 2 per cent., and hydrogen peroxide, 5 per cent., are his choice for irrigating fluids. In the discussion of bacillary colitis, the author states that serums are not effective in the presence of mixed infection, or when the intestine is distorted with ulcers, fistula, or stricture.

Under the subject of tuberculous enterocolitis the author states that surgical intervention is indicated in bowel tuberculosis when other measures fail, infection is virulent, hemorrhages frequent, diarrhea exhausting, the patient's strength is becoming rapidly depleted, and when there is complicating perforation, peritonitis, stricture, abscess or fistula. Operative interference is contraindicated when the sufferer is dying from pul-

monary tuberculosis or tuberculosis elsewhere.

Obstructive enterocolonic diarrhea may be due to the following lesions: Loose evacuations, or alternating diarrhea and constipation, congenital deformities, extra-intestinal pressure, stricture, tumors, foreign bodies, intestinal calculi, fecal impaction, adhesions, angulation, diverticulitis, pericolic membrane, sacculations, diseased mesentery, volvulus, kinks, hernia, invagination, procidentia recti, enteroptosis, colonic dilatation, enterospasm, parasites, hypertrophy of O'Beirne's sphincter, the rectal valves, or levator ani, sphincter muscles, coccygeal deviations and anorectal affections.

The various surgical measures used in combating these conditions are

discussed in this article.

Palpation of the Cecum. Pron, ⁶⁸ who has contributed many studies on the physical examination of the abdomen, gives his conclusions of the study of the palpation of the cecum in 123 subjects. This study has escaped the majority of internists, and is of the greatest importance. Pron says that it was palpable in about 50 per cent., and it was tender in others, there being, in all, 63 per cent. in which the cecum was abnormal. It varies in shape, position, and consistency in the same subject at different hours, but the author claims that there was a direct relationship between the pain induced in the cecum and abnormal con-

⁶⁷ Journal of the American Medical Association, November 10, 1917, lxix, 1603.
⁶⁸ Bull. de l'Academie de Médecine, Paris, February 5, 1918, p. 119.

ditions of the liver. In 50 patients with some form of liver condition, the cecum was palpable or painful in 32.

The Reviewer takes issue with the author that a palpable cecum is

necessarily a pathological one.

In every case he attempts to elicit the contour of the cecum by physical examination and it is surprising in how many cases it can be elicited. In 72 out of 108 gastric cases in which the stomach was found diseased, abnormal conditions were found in the cecum. The author argues, therefore, that a palpable or tender cecum should attract attention to the liver or stomach. He further contends that, even during constipation, sounds are heard indicating to his mind the possibility of a secretion produced by the cecum itself.

(In many cases, especially with the habitus asthenicus, the cecum is readily palpable. Not infrequently the tenderness elicited is over the inferior iliac plexus and can be found on the other side as well. More important is the fact that the material is dough-like or increased in consistence rather than liquid. The explanation of constipation, with liquid rales in the cecum, is to be found in the fact that the constipation is not

cecal but lower down in the bowel.)

Chronic Colitis. De Pury 69 discusses the importance of intestinal disturbances back of chronic appendicitis. In this article he points out the fact that many instances of chronic intestinal trouble are ascribed to chronic appendicitis. In fact, the simple removal of the appendix is liable to leave the main source of the trouble behind. In the great majority of cases, the cecum is diseased as well; of special frequency is perityphlitis with dilatation of the cecum and chronic appendicitis. With this is often associated some constriction of the colon below the hepatic flexure, with inflammatory lesions and adhesion formation. In fact this is usually where the trouble starts, bringing into play appendicitis, or even cholecystitis, pancreatitis, gastric or duodenal ulcer, and even favoring renal and intestinal disturbances, such as general atony. Perityphlitis, aside from chronic appendicitis, demands operation whenever the syndrome of pain, constipation, and auto-intoxication exists. The author attempts, by means of plastic operations, freeing adhesions, reducing the stagnation, to correct the condition. Uncontrollable vomiting, and various other conditions may be due to reverse peristalsis.

Constipation. Under the title of "Habitual Constipation," Thaysen⁷⁰ has written a series of articles dealing with this condition, and describes a clinical and roentgenological study of habitual constipation. He distinguishes the digestive disturbances which are more or less dependent on chronic constipation, and in which the dyspepsias subside with a cessation of the constipation. For instance, pains after eating and cardialgia were noted. In fact, cardialgia was noted in 73 per cent, of the women and 35 per cent, of the men. The female stomach is more liable to react to ptosis and the male stomach to secretory disturbances. Habitual constipation, according to this author, usually

Presse Médicale, October 27, 1917, No. 43, vii, 337.
 Ugeskrift f. Laeger, Copenhagen, March, 1918, No. 13, p. 467, abs. Journal of the American Medical Association.

becomes installed between the ages of fifteen and twenty. In 150 cases of gastric ulcer, 109 had a history of chronic constipation, but it was never so regular or persistent as in the colon cases. The regular hygienic methods are recommended for its removal.

Thaysen, in another article, discusses RECTAL CONSTIPATION. It is emphasized that those forms of chronic constipation accompanied by pain are to be found usually in the ascending colon. In fact, it is this form which usually gives rise to the diagnosis of chronic appendicitis. In 11 out of 112 cases of chronic constipation, appendectomy had been done, and without benefit to any of them. When there is associated rectal constipation or trouble of the descending colon, there is usually left-sided tenderness on physical examination. In only 6 cases, however, did the pain assume the character of actual colic. In many instances the pains of habitual constipation are ascribed to gynecological disturbances.

An interesting observation is the fact that in an examination of 6 healthy persons, both roentgenologically and digitally, there was found to be some material in the rectum. The accumulating feces could stay eight hours in the day, and fifteen hours including the night, without inducing a desire for defecation. This would suggest that it was not merely the contact with the rectal mucosa which initiated defecation, but rather that it proceeds from the central nervous system. In no case of rectal constipation was the sphincter abnormally contracted.

The Use of Magnesium Sulphate Solutions in the Treatment of Spastic Contractions of the Colon. Soper⁷² discusses the application of solutions of magnesium sulphate on the principle elucidated by Maltzer, namely, that magnesium sulphate, whether applied locally or administered intravenously, produced inhibition of peristalsis. The deduction followed that the same salt applied locally should be followed by a reduction of hypertonicities in that particularly segment of the bowel. There were 2000 cases of constipation studied, many of which showed contractures in the distal half of the colon; 240 cases were treated by the direct application of magnesium sulphate to the contracted segment

through the sigmoidoscope.

The results were very satisfactory, many obstinate cases being apparently restored to normal colonic function. Enemata of 3 ounces of saturated solution of magnesium sulphate were found to be very efficacious in postoperative abdominal distention. Some time ago Meltzer suggested the use of magnesium sulphate 25 per cent. solution through the duodenum in gall duct obstructions. Soper used the sigmoidoscope by which he claims no one would doubt the existence of a spastic form of constipation. In fact, the whole trend of the study of constipation seems to be toward the increasing recognition of the frequency of the spastic form of the disease. In eases in which the contraction is beyond the sigmoidoscope, diagnosis is made by the subjective symptoms, the characteristic fragmentary feces, combined with a strongly-contracted, palpable, tender descending colon or sigmoid loop. The x-ray diagnosis

Ugeskrift f. Læger Copenhagen, August, 1917, p. 1439.
 Tr. American Gastro-enterological Association, 1917, p. 87.

is extremely doubtful, according to the author, although I can recall how the first researches were made by Holzknecht and others largely through the x-rays. An obstinate form of constipation results from the combined contractures and dilatations, e. g., (a) atony of the rectum and sigmoid associated with contracture of the descending colon; (b) contraction at the rectosigmoidal angle and atony of the sigmoid loop; (c) contracture at the splenic flexure and descending colon and atony of the cecum.

Applied directly to the contractures, the action of magnesium sulphate was as follows in 240 cases:

(1) A saturated solution was found most efficient.

(2) The solution was applied by means of cotton applicators through the sigmoidoscope (knee-chest position). A characteristic deep pink color of the mucosa is observed within 10 to 20 seconds.

(3) Mild contractures disappear within a few seconds; moderate contractures require a minute or two. Strong spasms require a series of

applications to produce relaxation.

In the treatment of obstinate constipation of this class, 80 patients were treated by applications lasting from 10 to 30 treatments given every second or third day, 68 were apparently restored to normal colon function; 5 cases were accompanied by inflammatory findings, in which the treatment was ineffectual. In 7 cases, the contractures were overcome, but normal colon function was not resumed. Purgatives and water enemata are interdicted as they increase the tendency. Oil enemata, however, may be used in conjunction with the treatment. Cases in which the contractures are beyond the reach of the sigmoidoscope are treated by the introduction of a soft rubber eatheter through the sigmoid tube and the injection of two ounces of the magnesium sulplate solution.

In postoperative distention, the author recommends the use of magnesium sulphate solutions as follows: Three ounces of a saturated solution of magnesium sulphate is introduced by means of a rectal tube passed three or four inches into the bowel, elevating the hips wherever possible, and having it remain as long as possible. This procedure may be repeated every day, or several times a day if desirable. Not only is there flatus, and fecal material, but a pronounced absence of griping

and increased tenesmus.

The author's conclusions are as follows:

(1) Spastic contractures of the bowel or lower colon are etiological factors in many cases of chronic constipation.

(2) These contractures are the result of disturbances in (the mechan-

ism) Meltzer's law of contrary innervation.

(3) A saturated solution of magnesium sulphate applied locally to the contracted segment produces a relaxation. Repeated applications finally overcome the spasticity and permit the restoration of normal colonic function.

(4) Contractures in the rectum and lower sigmoid, with accompanying dilatation of the colon, are found in many cases of postoperative abdominal distention. Magnesium sulphate enemata are very efficacious

in relaxing the contractures, and thereby relieving the distention and gas pains.

(5) Enemata of magnesium sulphate are also very useful in partial organic obstructions in the rectum and lower colon, inasmuch as they relax accompanying muscular contractions without stimulating peristalsis.

(6) Magnesium sulphate solution, applied by means of the cotton applicator, greatly facilitates the introduction of the sigmoidoscope.

Amebic Dysentery. Amebiasis. Carnot and Turquety⁷³ give a thorough resumé of exotic diseases, the principal one of which is amebiasis. This subject is particularly opportune, and this article is reviewed in detail because of its great importance at the present time. The article is easily one of the best which has yet appeared. Amebiasis has undergone marked extension in France owing not merely to the fact that many of the French soldiers have been stationed in infected countries (Morocco, Dardanelles, Macedonia), but also by the fact that the presence of colonial troops previously infected have produced a spread of the disease. The following are the important points regarding its diagnosis and treatment:

The examination of the movements alone will demonstrate the presence of ameba. They are to be found during the crises of dysentery and

between the crises.

(a) During the crises but little fecal material is discharged, the material being mainly mucus tinted with blood. The examination shows many erythrocytes, leukocytes (especially eosinophiles) and bacteria. It is at this period that the search for pathogenic ameba should be made and the stoools should be examined immediately after their emission, or placed in a stove at 37° C., inasmuch as the organism is very sensitive to cold, is rapidly killed and very soon loses its motility, a characteristic which it is important to demonstrate. They can also be examined in fixed preparations stained with iron hematoxylin and eosin, after the so-called moist fixation of Bouin. The fresh preparations are studied between warm slides and cover-glasses, or on a warm stage.

The entameba histolytica has the following characteristics:

(1) The ameba is a protoplasmic mass of large size (25 to 50μ). (2) It is very mobile, putting forth numerous pseudopods, moving

(2) It is very mobile, putting forth numerous pseudopods, moving with considerable rapidity, completely displacing its contents.

(3) It is definitely differentiated into a granular endoplasm and a hyaline ectoplasm, the endoplasm having a light yellowish or greenish tint.

(4) Finally, the important characteristic, included in its endoplasm

are erythrocytes, often numerous.

These characteristics differentiate it from the so-called ameba coli, or non-pathogenic ameba in man, inasmuch as the latter is poorly motile, does not contain red cells, and the distinction between the endo-and ectoplasm is not so pronounced.

(b) Between the crises, at this stage the movements are solid or pasty, and the ameba are rarely found as such. But the cysts are to be looked

for. The technic employed is to place a small amount of the colon mucus from the outside of the movement between a slide and cover-glass, and stain it with Gram's liquid. Furthermore, it might be recalled that the cysts are preserved in formalin.

The cysts may be made more abundant in the stools through the employment of purgatives, the use of irritating enemas, such as the iodine iodide mixture (Mauto) or by an intravenous injection of cyanide of mercury

(Ravaut).

The following are the essential characters of the cysts:

(1) The dysenteric cysts are small (fresh, and unfixed they measure 10 to 15μ).

(2) They have four nuclei.

(3) The cyst is moderately refractive, its enveloping membrane being very thin.

(4) Finally, it contains very refractive chromidium rods.

These characters are opposed to those of the ameba coli which is larger (15 to 25 μ), has eight or more nuclei, a much thicker membrane,

is in general more refractive and without chromidium.

In the chronic form of the disease, it is not infrequent to find, associated with the cysts, the ameba of the form of the so-called E. tetragena, larger than the E. histolytica (20 to 25 μ) with protoplasm poorly defined, and rarely containing red cells. According to Mathis and Mercier, it is the form characteristic of the chronic period; according to Deuling, it is simply a senile form of the ameba. Culture of the organisms has been realized (Cunning, Law and Lewis, Lesage, Gauducheau, Noc), while experimental reproduction (especially with the dog, rabbit, and cat) is easy.

In this war, authors at the front have signalled the association of amebiasis with bacillary dysentery, leading to considerable confusion. This association, indicated by Dopter, has been seen at the front by Rayaut and Krolunitsky, Fresseinger and Leroy, Roussel, Brule, Barat. A. P. Marie. The isolation of the bacilli and the agglutination reaction in the blood justify the diagnosis of bacillary dysentery, but the failure of treatment led to a search for ameba which were found in abundance. Other parasites are frequently associated, most often the flagellates,

lamblia, trichomonas, and occasionally round worms.

CLINICAL FORMS OF AMEBIC DYSENTERY. The important point to remember is that amebic dysentery is a chronic disease with acute exacerbations; this is opposed to bacillary dysentery which is an acute infection. In many instances amebic dysentery is a chronic diarrhea and not a true dysentery. On the other hand, there are types of the disease which are fulminating and choleriform, the so-called "type suraigue" of the French.

Several methods of diagnosis have been described, namely, the rectoscopic examination (Bensaude, Carles and Froussard) in which ecchymoses, ulcerations, polyps, occasionally false membranes, polymorphous lesions are found. In fact, the passage of the proctoscope higher than 13 cm. from the rectum is often impossible, owing to the edema and induration of the intestinal walls, as well as the spasm provoked by the ulceration.

Florand and Bensaude have also attempted to study these lesions by radioscopic examination and point out their characteristics as shown on the screen after the injection of bismuth lavements. The liquid rapidly ascends the rectum and iliac colon—without distending either—in the form of a thin, ribbon-like column; it continues to ascend in short succesive bounds like mercury ascending a thermometer. The image of the rectum is practically always abnormal, being either a narrow cylinder or, again, in severe cases, the picture gives the impression of an absence of the superior portion, as if it had been amputated. The iliac colon is likewise shown as a narrow band, and rigid, like a cylinder. In this same paper are discussed the visceral complications of this disease.

Treatment. The specific treatment is, of course, ipecac and its alkaloid, emetine. Chauffard believes that the daily dose of 0.04 gram is small, and that the dose can be pushed to 0.08 to 0.12 gram per day. However, even in the smaller dose, a few deaths have been reported. Escomel, in the countries where this disease has been endemic, has been able to cure all the abscesses without puncture. He gives a first series of thirty injections of 0.04 gram, then, after ten days of rest, a second series of ten hypodermics; 0.08 gram per day for three days; 0.06 gram from the fourth to the seventh day; 0.04 gram from the seventh

to the tenth day.

The double iodide of emetine and bismuth has given very encouraging results. Three doses of 6 centigrams per day for twelve days is the method employed. The phenomena of intolerance are considerably

lessened by the employment of keratin-coated capsules.

Salvarsan has also been used in this disease. Ravaut and Krolunitsky use in their treatment the so-called emetine-arsenic cure giving, in the acute form, 10 intravenous injections of 0.3 gram of neosalvarsan, and leaving between each injection an interval of two days, during which 0.02 to 0.06 gram of emetine is injected daily. The author sterilizes his cyst-carriers by the use of 0.05 gram of neosalvarsan in keratin-coated capsules twice a day for ten days. Mention is also made of the use of antiseptic irrigation of the colon, or the typical application of either 10 per cent. silver nitrate, or potassium permanganate, 0.2 per cent. Furthermore, twice daily the insufflation with pure oxygen gas has caused a disappearance of both the ameba and the cysts from the stools.

CHRONIC ENTERITIS IN AMEBIASIS. Mouriquand and Deglos⁷⁴ discuss the enteritis accompanying amebiasis. Many of the points in their paper are covered by those described by Carnot and Turguety. However, there are a number of points which are worthy of consideration.

These authors describe three varieties of chronic intestinal manifestations of amebiasis:

(1) The first variety in which the diarrhea predominates. It almost always precedes the second variety. It indicates involvement of the small intestine.

(2) In the second group, the whole tract is involved, but the small intestine reacts less, and the involvement of the large bowel becomes more

pronounced. It is accompanied by creamy and pasty stools and not watery movements.

(3) In the third variety, the large bowel is predominatingly at fault.

The movements being typical of mucus colitis.

First Type Diarrhea. The patient enters the hospital with a rebellious diarrhea, 4 or 5 movements a day, or more, over a long time, movements which exhaust the patient and produce emaciation. The movements are of black or brown liquid, often deep green, more rarely light yellow. They contain considerable liquid, fetid, but never as fetid as the putrid diarrhea coming from the putrefaction of meat. In a glass, the liquid movement deposits considerable sediment. The reaction is more often neutral, or acid, than alkaline. Occasionally, there is a positive occult blood reaction. Microscopically, granular débris, cellulose, and fat, with a rich bacterial flora are present.

Clinically, the patient shows the following characteristics: Appetite poor, tongue coated, hepato-intestinal intoxication, great emaciation, often a little distention of the abdomen, and some tenderness on palpation over the region of the small bowel and the line of the colon. Often slight congestion of the liver, which may be somewhat enlarged and tender on palpation. The urine is concentrated, containing a small amount of urobilin, and considerable scatoxyl and indoxyl. This form

may persist for a long time, or may change to the second type.

Second Type. Creamy, pasty stools, or stools "en purée." These three characteristics are the essential points regarding the movements, which may be more or less liquid, more or less creamy or thick, varying in color from black, green, or brown, to even a light yellow. The surface of the movements is nearly always glazed with an abundance of mucus. It is in these stools that ameba and their cysts are most often encountered. The patient has almost always 2 to 4 stools in twentyfour hours. Not infrequently the movements are foamy, owing to the presence of fermentative diarrhea due to the farines and vegetables, readily recognizable by their microscopical characters. Microscopically, the food débris, less frequently than the former variety, shows globules of fat, fatty acid crystals, and also Charcot-Robin crystals, as well as orange crystals of hematoidin.

Clinically, the patient is more at repose, less exhausted than in the first type. The appetite and tongue may be almost normal. Functional troubles are more apparent, distention of the abdomen, a sense of discomfort and distress, false calls to stool after eating, tenderness on palpation along the colon, particularly the ascending colon, reflex contraction of the colon on palpation. The liver is normal, occasionally enlarged, but goes down under intensive treatment with emetine. The spleen is normal except when malaria is associated, which is not rare. The urine more closely approximates normal and contains less urobilin,

scatoxyl, etc.

Third Type. Stools of the form of mucous colitis in ribbons. Diarrhea and constipation may alternate. The movements are soft, compact, and the whole mass has a glistening aspect, due to the intimate association of mucus. Occasionally, small parcels of mucus are seen on the surface, but packets of mucus and false membranes are never found. The reaction of Triboulet by the rose reaction shows improvement in hepatic and intestinal function, there being a more complete transformation of bilirubin into stereobilin.

Prognosis. The first variety will frequently result in a rapid reduction in the nervous resistance of the patient and emaciation; in the last two, the general health is better conserved. If, however, there is a reversion to the first type, a rapid depreciation can occur, but in nearly all cases the patient is in for a prolonged illness. The possibility of a liver complication must be always entertained.

Diagnosis. The microscopic diagnosis has been discussed in the previous paper. The differential clinical diagnosis, however, is of importance, and, on this subject, the authors have the following to say:

Mucomembranous colitis with its habitual constipation punctuated with diarrheal attacks, its packets of mucus and false membranes in no way resembles amebic dysentery. In the chronic forms of enteritis, however, where repeated examinations fail to disclose the ameba, the state of gastric, pancreatic, and hepatic function should be investigated. The microscopic character of the movements will throw considerable light on this question. Certain forms of uremic diarrhea, and diarrheas following convalescence of typhoid and paratyphoid may prove confusing. In another group of cases where the nutrition is poor, the possibility of intestinal tuberculosis will be entertained, but in the latter the pasty, creamy stools, and the characteristic stools of the third type are not seen: furthermore, the diarrhea is continuous. The movements are more liquid, often following meals, and give the patient no relief from abdominal discomfort, such as is often enjoyed by old amebiasis cases. The association of bacillary dysentery must also be entertained, but there is an absence of intestinal sequels after bacillary dysentery (B. of Flexner) which is opposed by the frequence of these findings in chronic amebiasis. Differentiation must also be made of other intestinal parasites, lamblia, trichomonas, tricocephalus, and even an enteritis seen in certain forms of malaria.

Hewlett, in discussing tropical diseases, mentions particularly the conclusions of Knowles and Cole on entamebic cysts based on a series of 3000 observations of 50 patients. Their conclusions are summarized as follows:

(1) Throughout the examination of 528 stools for entameba, we constantly found difficulty in deciding between E. coli and E. histolytica. The diagnosis for a given patient might vary from day to day as regards the type of cysts prevalent, while the presence of the ameba was also decidedly intermittent. Ameboid forms resembling E. histolytica were found in patients who denied all history of dysentery, while cysts of E. coli might be the prevailing type of organism in cases of acute dysentery, which were still passing blood and mucus. If different species exist, then they are usually simultaneously present in both acute and convalescent dysentery cases.

(2) 1, 2, 4 and 8 nucleate cysts are present in both dysentery and non-dysentery—although the prevalent type of each is different. This finding is not inconsistent with the view that entamebic species are, in reality, one and the same thing, and that amebic dysentery is due to a

single protozoal organism, usually present as a harmless commensal, but able, under certain conditions, to waken into pathogenicity.

(3) The differences between the ameloid forms of entameloic species

are relative, subject to variation, and not absolute.

(4) 1, 2, 4 and 8 nucleate cysts are met with in both E. coli and E. histolytica infections. It is already admitted by many authorities that E. histolytica may form an 8 nucleate cyst.

(5) There is no differentiation between the species as regards size of

cvsts.

(6) The differences in nuclear detail between the species E. coli, E. minuta, and E. histolytica are not inconsistent with the view that the latter two "species" are the less adult forms of the former.

(7) The "species" show no distinctive difference as regards contour, glycogen content, vacuolation, and presence of "chromidial rods" in

the cysts.

(8) E. tetragena is usually regarded as identical with E. histolytica, and our results confirm this view. E. minuta is usually regarded as the pre-cyst of E. histolytica, whereas we have found minuta forms associated with both E. coli, and E. histolytica. When the prevalent type of organism was E. minuta, it was commonly in association with 8 nucleate cysts and resembled E. coli.

(9) We believe that these "different species" are all one and the same organism. We suggest that the name Entameba coli communis should replace the terms E. coli, E. histolytica, E. minuta, E. tetragena, etc.

(10) E. coli communis is, then, the common entameba of the human intestine, is usually non-pathogenic, but liable on occasion to become pathogenic, and to cause the lesions of dysentery and amebiasis. The determination of the total ameba count, together with that of the prevalent type of ameboid or encysted form present, will enable the observer to state (a) whether the ameba is in its pathogenic state or otherwise; (b) what is the patient's progress from day to day; and (c) whether the convalescent is, or is not, a possible carrier.

Full details are given in the paper, which is illustrated with a number

of beautifully colored plates.

ENTAMEBA HISTOLYTICA CARRIERS TREATED WITH EMETINE-BISMUTH IDODIDE. Lilie and Sheppheard⁷⁵ discuss the treatment of the carriers of the E. histolytica with the emetine-bismuth idodide: 104 cases were treated in a special ward. They were given the drugs in keratin or salol-coated tablets, in doses of 3 grains a day, for 12 consecutive days without any other treatment. A patient was considered cured when a half-dozen tests, over a period of not less than seven weeks from the termination of the treatment, were negative. From these studies it was evident (1) that carriers that do not have injections of emetine hydrochloride were cured, in 78 per cent. of cases, by 2 courses of the salol-coated pills; (2) that 72.8 per cent. of those who have had emetine injections were cured by two courses of salol pills. Another series received keratin-coated pills, and of these the group who had not emetine injections were cured, while of those who had the in-

jections, 45.4 per cent. were cured by two courses of the keratin-coated tablets.

In comparison with the above percentages of cures, with a maximum of 72 grains of the drug, the authors give the number of cures in other wards of this hospital. These patients receive from 36 to 200 grains of the drug, and were regarded cured when five successive examinations during five succeeding weeks were negative; 142 out of 160 were cured, 88.7 per cent.

It appears from these studies that emetine-bismuth idodide is not effective by the length of time which intervenes between the onset of the symptoms and the application of the cure. Furthermore, there is no ground for the belief that vomiting diminishes the chances of cure by this drug. From these studies it is evident that the salol-coated pills are preferable to the keratin-coated tablets, causing less vomiting and

less loss of weight.

Jepps and Meakins⁷⁶ attempted to overcome the nausea and vomiting induced by emetine-bismuth idodide. They used preparations made by three different firms, and all prepared with some material supposedly insoluble in the stomach. In none of these cases, comprising 23 courses of treatment incomplete but in 8 cases severe diarrhea and abdominal cramps occurred. It is evident that nausea and vomiting occurs most frequently when the stomach is empty and toxic symptoms disappear after a time which seems to indicate that a certain amount of tolerance has been established. In 11 cases the drug was administered in a cachet of 3 grains each. Ten of these, or 91 per cent., were cured after 12 daily doses.

DISTRIBUTION. Bayma⁷⁷ states that the reports from the war indicate that there is a wider distribution of amebic dysentery in the temperate zones than was formerly believed. In 1916, 10 per cent. of 5429 stools examined showed ameba. He was one of the first to use epinephrin in this disease. Emetine and biniodide of bismuth and emetine have a more or less depressing action in amebic dysentery. Epinephrin, on the other hand, suppresses the colic and tenesmus. It is given by mouth in doses from 3 to 5 mgm. without raising the blood-pressure. Patients who received this treatment two years ago have remained well.

Calame⁷⁸ mentions the fact that great improvement was realized under rectal injections of emetine and silver nitrate. In the incipient form of amebic dysentery, emetine routs out and attacks the organisms, but, when the disease is deep rooted and chronic, injections of emetine fail to relieve the condition. Under these circumstances local measures are preferable, and he even injects neosalvarsan, which he finds extremely effective in rebellious cases. It is possible that this method might be even more effectual if used by appendicostomy.

Bacillary Dysentery. Martin and Williams⁷⁹ discuss the question of the isolation of the dysentery bacilli from the stools. They state that, previous to the war, there was a widespread notion that it was as easy to

⁷⁶ British Medical Journal, November 17, 1917, p. 645.

79 British Medical Journal, April, 1918, p. 447.

⁷⁷ Annales Paulistas de Med. Chirurgie, Spalo, August, 1917, p. 173.
78 Revue Méd. de la Suisse Roman, Geneva, February, 1918, p. 125.

isolate the dysentery bacillus, as it was to demonstrate the diphtheria organism. Their experiences in the Mediterranean and in Egypt demonstrated that, after the first two days of the disease, it is very difficult to demonstrate the organism. Seligman and Cossman, from a laboratory near the front, came to the same conclusions. Their results show 70 per cent. the first week, 53 per cent. the second week, and 18 per cent. the third week, after that practically none. The authors attempted to recover the dysentery bacillus 1050 times in that disease, with the following results: To the fifth day, 68 per cent.; sixth to the tenth day, 17.4 per cent.; eleventh to the fifteenth day, 6.3 per cent.; and after that only an occasional case. Hosts of intestinal organisms soon overcome the dysentery bacillus. It should be borne in mind, therefore, that in the diagnosis of bacillary dysentery the probability of demonstrating the organism is inverse to the day of the disease.

Hookworm in the Brazilian Navy. Carrero⁸⁰ takes exception to the criticism that hookworm is prevalent in the Navy. He cites his experience as fleet surgeon for six years, and claims that salt water is unfavorable to the propagation of hookworm and that its transmission on ships is exceptional. Among 6511 marines and crews stationed at Rio in 1916, there were 214 who were given treatment for hookworm, but he doubts whether in any instance they acquired it after entering the Navy.

There is no death attributable to hookworm in the Navy.

Balantidium Coli in Argentine. Parodi, si and his associates, report 3 cases of balantidium infections in persons who had lived in Argentine. The histories indicate that the disease exists in that country and is liable to breed healthy carriers. The first case was a boy, aged eight years, apparently healthy, but his stools contained not only the balantidium coli but also the necator hymenolepis, and the tricocephalus. Repeated examinations showed that the balantidium disappeared from the stools in the course of two weeks, the assumption being that probably the exclusive milk and vegetable diet contributed to its disappearance. In the other 2 cases, the condition was severe, and only yielded after the suppression of meat, and treatment with acid enemas, and intravenous injections of 0.01 gm. of mercuric cyanide. No specimens could be discovered after the ninth day. The other patient, a boy, aged nine years, died, the intestinal mucosa revealing ulceration and burrowing of the parasites. In each case the discovery of the parasite was casual. In the first case it caused no symptoms; in the second case, periods of tenacious diarrhea alternated with periods of good health. In the third, the toxic necrosis of the bowel rapidly proved fatal.

Tapeworm in Argentine. Parodi⁵² found the ova of the hymenolepis nana in 8 per cent, of the children's stools examined at Buenos Aires, and in 0.66 per cent, of the adults' stools. Some of the children show gastro-intestinal symptoms and two manifested epileptiform attacks. It is interesting to note that in one instance with severe nervous symptoms some one noticed that the child's nose itched a good deal, whereupon an examination of the stools revealed these ova. The child was found

82 Prensa Medica, Argentine, January 10, 1918, p. 294.

Se Brazil Medico, Rio de Janero, August 11, 1917, xxxi, No. 3, 271.
 Semana Medica, Buenos Aires, July 12, 1917, No. 28, p. 35.

to be markedly infected, and treatment resulted in not merely a cure

of these infections but a disappearance of these attacks.

Chatteriee⁸³ describes a flagellate organ found in a dysenteric patient. This patient had intestinal disturbance for a week, and, while there was no ameba found, a cover-glass preparation revealed a large number of actively motile flagellates. Their appearance differed from the flagellates ordinarily found in that vicinity, namely, the lamblia, pentatrichomonas, or macrostoma. Some of these were circular in shape. It has some resemblance to trichomonas, but the absence of an undulating membrane, a well-marked axostyle, and a tail prove that it is not this organism. It has also some resemblance to copromastix, prowazeki of Aragoo, which has four flagella, but in the latter all the flagella are directly forward, whereas in this parasite one flagellum is directed backward. It has the structure of the trichomastix, as defined by Parisi, which has three anterior flagella and one recurrent flagellum not adherent to the body to form an undulating membrane. As a trichomastix inhabiting the human intestines has not been described, this author⁸⁴ feels justified in describing it as a new species.

Chronic Diarrhea. Friedenwald⁸⁵ reported a study of 100 cases of chronic diarrhea, due to enterocolonic conditions. The following is his

classification:

- Catarrhal enterocolitis.
- 2. Ulcerative colitis.
 - (a) Amebic.
 - (b) Bacillary.
 - (c) Tubercular.
 - (d) Luetic.
 - (e) Carcinomatous.
- 3. Mucous colitis.
- 4. Simple colonic infections.
- 5. Intestinal stasis.
- 6. Chronic appendicitis.
- 7. Disturbances of endocrine functions.
 - (a) Pancreas.
 - (b) Adrenal.
 - (c) Thyroid.
- 8. Toxic origin.

Attention is called to the possibility of the presence of pancreatic cancer in cases of chronic diarrhea in individuals over forty years, other

conditions being excluded.

RECTAL AND SIGMOID CONDITIONS IN CHRONIC DIARRHEA. Jelks 56 discusses the conditions found in rectum and sigmoid in chronic diarrhea. They may be due to amebic, bacillary, flagellate, or some other infectious agent which may persist over a long period of time. Again, the case may be due to primary and secondary etiological factors, as, for instance, a bacillary form of the disease becoming infected with ameba. Again, they

⁸³ Indian Journal of Medical Research, Calcutta, July, 1917, p. 217.

Abstract, Journal of the American Medical Association.
 Journal of the American Medical Association, November, 1917.
 Ibid., November 17, 1917, lxix, p. 1671.

may be due to the primary condition, in which the infecting agent has disappeared but the complication, or result, has persisted, as, for instance, an amebic infection in which the ameba have disappeared but there is a secondary streptococcic infection. Diarrhea may persist after all signs of the causative condition have disappeared. Again, there are contributory physical and systemic diseases, such as those accompanying cirrhosis of the liver, diabetes, and acidosis. The author points out that the difference between the amebic rectum and sigmoid, and the pellagrous and bacillary intestine, is that in the former the nucous membrane appears thicker and more edematous, and the ulcerations have proved more destructive to the deeper layers, whereas in both bacillary and pellagrous intestines there is less edema, except in the very acute conditions, and the oozing is from every surface as if the vasoconstrictors were paralyzed, and the blood was oozing from every capillary.

If the rectum and sigmoid are examined from time to time between these recurrent attacks of pellagrous diarrhea, the conditions will be seen to vary between these two extremes just described, or the intestines may be congested and coated with mucus, and, after the mucus is wiped away, pin-scratch or circinate lines or discrete erosions may be seen. The intestine may appear blanched, owing to the low conditions of the hemoglobin and the inanition, yet, with the recurrence of the symptoms, the blush and the ooze reappear on the mucous and serous surface. Not only is this the case with the rectum and sigmoid flexure, but this is the condition we find throughout the colon, including the appendix, and, to a certain degree, this is the condition we find throughout the entire intestinal tract. Pericolic veils are mentioned by the author as occur-

ring in consequence of pellagra.

Cancer of the Rectum and Pelvic Colon. Lynch⁸⁷ gives the following tabulation of 491 cases of cancer of this region of the gastro-intestinal tract; 51 died and 253 recovered, a mortality of 62 per cent., for a radical excision. The remaining 41 cases, not included in this series, were

inoperable cases, in which colostomies and palliative operations were

performed:

Males										231
Females										210
Adenocarcinoma										451
Epithelioma										15
Colloid carcinoma				۰						4
Scirrhous carcinoma .										4
Round-cell sarcoma										5
Melanosarcoma .										5
Lymphosarcoma										4
Spindle-cell sarcoma										3
Patients operation on .										344
Radical excision										
Simple abdominal section										20
Combined operation .										111
Operations in one stage										75
Operations in two stages										36
Perineal										102
Kraske operations										20
Operations by modified be	one-	-flap	m	etho	od					32
Intrarectal operations .										18
A										

S. Journal of the American Medical Association, November 24, 1917, lxix, 1775.

An interesting thing regarding cancer is the fact that this disease can occur even in childhood; 0.5 per cent. were in children under nine years of age, 2.5 per cent. were patients under nineteen, 7 per cent. were under thirty years, and 9 per cent. between thirty and thirty-five years.

AGE OF CANCER PATIENTS.

			 							No. of patients.
Under 20 years										4
Between 20 and 30										32
Between 30 and 40										
Between 40 and 50										
Between 50 and 60										
Between 60 and 70						٠.		٠	٠	91
Between 70 and 80										
Between 80 and over										. 7
Not stated		٠		٠			٠	* .		1.6
										491

Cachexia seldom appears until cancer is far-advanced, and then principally in old persons and in those with cardiovascular diseases. Except in advanced cases, the cancer cannot be felt through the abdomen. Nearly always when a mass is felt, it is an accumulation of feeal material above the site of the tumor and offers the first indication of the trouble. In this way the condition is frequently first recognized. The average duration of symptoms, before the patient was admitted, was eight months.

LENGTH OF TIME THAT SYMPTOMS OF CANCER HAD BEEN APPARENT.

								No. of. patients
Under 4 months	٠,	,•						54
From 4 to 6 months								87
From 6 to 9 months								99
From 9 to 12 months								102
From 12 to 18 months								
From 18 to 24 months								45
From 24 to 30 months								14
From 30 to 36 months								8
From 3 years and over								3
Not stated								37
Total								491

Twenty per cent. of these cases had an incorrect diagnosis, and were treated for stomach and intestinal troubles when the condition was in reality remote from that region.

Incompetency of the Ileocecal Valve versus Lane's Kink as the Cause of Iliac Stasis. Kellogg⁸⁸ states that "consideration of the ileocecal valve in relation to iliac stasis reveals a very different picture. A brief summary of the facts which have been elucidated by the observations of Buhin, Kraus, Hertz, Ad. Schmidt, Elliott, Keith, Cannon, Case, the writer, and others are as follows:

1. All vertebrate animals, even fishes and reptiles, are provided with an efficient ileocecal valve. The presence of this check valve, between

the midgut and the hindgut, is as universal as the pyloric sphineter between the foregut and the midgut. The only possible inference to be drawn from this fact is that the ileocecal valve must have an important function to perform, the nature of which, though formerly obscure, is now made clear by the researches of Cannon and Elliott in animals, and Case, Swartz and others in x-ray studies of the human alimentary canal.

2. A check valve at the junction of the small intestine and the colon is essential for definite and permanent advance of bowel material, because of the back pressure due to the normal tonicity of the large gut and the accumulation of material in the colon which normally empties intermittently and not continuously. The check valve is in constant use in engineering practice under similar conditions in steam engines, heating systems, etc. The ileocecal valve is a most admirable illustration of vital mechanics.

3. In addition to the back pressure resulting from the accumulation of gas, liquids, and semisolids in the colon, additional pressure, reacting against the ileocolic junction, is induced whenever the bowels move as a result of the contraction of the diaphragm, the abdominal muscles, and of the colon itself.

4. Another factor tending to produce reflux from the colon to the small intestine and necessitating intervention of a check valve at the ileocolic junction is found in the periodical contractions of the cecum and ascending colon.

5. A still more powerful factor tending to produce a back-flow from the colon into the small intestine and creating an absolute necessity for the ileocecal valve is found in the retroperistaltic action of the right half of the colon.

This reversed action of the colon is a powerful movement which starts about the middle of the transverse colon, and forces the intestinal contents back toward the cecum for the purpose of causing delay sufficient to permit the absorption of a considerable portion of the water content of the material sent into the large gut from the small intestine. The action is most vigorous after meals. It was discovered by Cannon in animals, and demonstrated in human beings by Case.

6. The ileocolic valve, when normal, is a perfect and highly efficient mechanical device. It even works in the dead subject, and in the intestine when removed from the body if care is taken to avoid injury to the parts.

7. When the ileocecal valve is incompetent, even slight pressure upon the distended cecum is sufficient to cause reflux of gas and liquid into the ileum.

8. In the living body, incompetency of the ileocolic valve is practically always associated with iliac stasis. The incompetency is nearly always demonstrable by the x-rays, but sometimes the x-rays fail to show the incompetency, even when the condition is marked. There is little or no evidence that spasm of the gut at the ileocolic junction is a frequent cause of stasis.

9. In most cases of the ileocecal valve associated with iliac stasis, as proved by x-ray examinations by Case, and verified by both the writer

and Case at the operating table in connection with various abdominal operations, Lane's kink was absent; that is, no adhesions of the terminal ileum were found in most cases, and, in the very small number of cases in which Lane's kink was present, the stasis was no greater than in those cases in which adhesions of the terminal ileum were absent.

10. In some scores of cases in which Case was able to show, by the x-rays, the presence of Lane's kink without incompetency of the valve,

iliac stasis was present in only 2 or 3 cases.

11. Case, who has observed iliac stasis in several hundred cases, estimates that he finds the stasis due to obstructive adhesions of the terminal ileum in not more than 3 or 4 per cent. of all cases of stasis in the small intestine. His observations demonstrate most clearly that the usual cause for iliac stasis is incompetency of the ileocecal valve.

12. It is well known to abdominal surgeons that iliac stasis is rarely, if ever, cured by the breaking up of the adhesions about the terminal ileum. It was this fact which led Sir Arbuthnot Lane to devise the

operation of short-circuiting.

13. When incompetency of the ileocecal valve is associated with iliac stasis, it is cured by repair of the valve without breaking up the adhesions

of the terminal ileum when these are present.

14. The relief of symptoms sometimes obtained by the operation of short-circuiting is rarely ever more than temporary. The iliac stasis ultimately returns through the dilatation of the intestine which is inevitable when the newly-made ileocolic junction is not protected by a check valve as under normal conditions. The small intestine may be, for a short time, able to keep itself empty, because relieved of the back pressure from the antiperistaltic action of the transverse colon. But the absence of a barrier against reflux at the ileocolic junction permits the backing up of fecal matter from the pelvic colon after the blind-ended colon has first been filled, and the small intestine is gradually dilated until several feet of it become nearly as large as the colon. Case has demonstrated that incompetency of the ileocolic junction and reflux exist in practically all cases of short-circuiting performed by Lane's method, which makes no effort to provide the protection of a valve.

15. The writer has demonstrated that the recurrence of iliac stasis after the operation of short-circuiting may be prevented by making an artificial ileocecal valve. He has also succeeded in constructing an efficient valve in cases in which a short-circuiting operation had been previously done by other surgeons without affording relief. This shows that repair of the valve is the curative measure, and not the short-circuiting. (Of course, there are rare cases in which the colon must be

sacrificed.)

16. In cases of chronic iliac stasis, the walls of the gut are thin and atrophic, evidently the result of degeneration from overwork and chronic infection. The lumen of the gut is normal. In stasis due to obstruction, the intestinal wall is inevitably thickened and hypertrophied while the lumen of the gut is notably increased, showing the effects of forcible distention. This is never seen in intestinal stasis of the ordinary type.

17. The periodic contractions of the cecum, alternating with strong retroperistaltic waves starting in the transverse colon, must inevitably cause reflux of the colon contents into the small gut unless movement in this direction is checked by the ileocolic valve. And this action is not occasional, but constant, for hours after each meal, so that, in a person whose ileocolic valve is incompetent, the ileum is seldom, if ever, empty. Normally, the gut clears itself of a meal within eight or nine hours, thus ensuring the gut a period of rest at least during a part of the twenty-four hours."

Constipation. Spastic Constipation. Morgan⁸⁹ found that out of 41 cases of spastic constipation only 24 had pyrosis, while 29 failed to reveal any symptoms. Twenty-seven complained of acid regurgitation from one-half to two hours after eating, and 17 did not have it. In 39 cases the appetite was normal or increased, and in 5 the appetite was absent. Ten of these patients complained of vomiting, and 13 of nausea.

Now, turning to a consideration of the *objective symptoms*, we find that hypertonia of the viscus was present in a large majority of cases of this series.

STUDY OF THE GASTRIC CONDITIONS IN SPASTIC CONSTIPATION.

			No.			No.
Pain		Present .	15	Absent		29
Tenderness		Present	25	Absent		19
Eructation		Present	24	Absent	,	13
Regurgitation .		Present	27	Absent		17
Vomiting		Present	10	Absent		34
Fulness		Present	32	Absent		12
Pyrosis		Present	24	Absent		20
Appetite		Present	39	Absent		5
Nausea		Present	13	Absent		31
Mucu-		Excess	34	Normal		10
Benzidin		Positive	18	Negative		26
Size		Normal	42	Negative		
Position		Normal	36	Negative		8
Motility			37	Hyper		7
Mobility			44			
Shape			44			
Tonus (hypo 2)		Hyper	26	Normal		16
Evacuation		Normal	43	Slow .		1
Acidity (hypo 2)		Hyper	17	Normal		17

On fluoroscopic examination, 26 revealed spastic contraction of the stomach; whereas 2 were atonic and normal in this respect. Evacuation time was normal in 53 cases, and retarded in 1 case. The stomach was normal in shape and mobility in all the 14 cases under consideration; all but 2 were of normal size; these 2 were dilated. In 36 cases the stomach was in the normal position, and 8 cases showed more or less ptosis. In 7 cases hypermotility was present, and in 37 normal motility.

Studying the gastric secretions, we noted that 17 cases showed moderate hyperacidity with hypersecretion, 10 showed subacidity, and 17 normal values.

⁸⁹ Journal of the American Medical Association, 1917, No. 20, lxix, 1675.

Enterocolonic Conditions in Chronic Constipation. Hanes⁹⁰ discusses the bacterial factors producing chronic constipation. first part of the intestinal tract in which we observe stagnation is in the terminal ileum where there exists a thickening of the muscle fibers, offering a greater resistance than the intestine above. The next point is the ileocecal junction. The large bowel, however, is the principal seat of constipation, and Hanes claims that the cecum and ascending colon are concerned, either directly or indirectly, in a large proportion of cases. The frequent stagnation of the right colon is explained as follows: (1) The anatomical arrangement is such that progress of the fecal current is retarded. The large intestine, becoming progressively smaller from the cecum to the sigmoid, requiring increased pressure; (2) the watery portion of the feces is rapidly absorbed, so that it requires greater pressure to overcome the natural obstructions at the hepatic flexure, the decrease in the size of the colon, and the increased consistence of the contents; (3) a very important reason is the contracted state of the musculature at the terminal end of the large gut, namely, the sigmoid and rectum. In many of these cases there is a spasticity which cannot be overcome by normal effort; (4) there must be a normal balance of intracolonic pressure, in other words contraction from irritation or inflammation at one point, and dilatation at another is conducive to just this condition; (5) not infrequently, the entire colon is larger than normal, the muscle fibers being attenuated and weak, and therefore unable to contract with sufficient power; (6) a long transverse colon and a redundant sigmoid; (7) organic obstruction which is only overcome by keeping material in that portion of the bowel; (8) the most important single condition producing symptoms in the opinion of this author is the role of bacterial life.

The first effect of bacteria is to produce an inflammatory reaction in the mucous membrane, so that it becomes roughened, retarding the intestinal contents. The second important influence of bacteria is on the bowel muscle which, when acutely affected, produces an exaggeration of muscular contraction, mucus, diarrhea and dysentery. When this condition becomes chronic, the muscle relaxes under the influence of bacterial infection with increasing dilatation of the intestinal wall. Atrophy of the mucous glands, increasing granulation of the intestinal wall and pronounced constipation. Infection in the intestine may be limited to narrow bands, or involve the entire colon, as well as the lower part of the ileum. It may never invade the intestinal serosa, or it may produce extensive veils, bands and adhesions. The rectal causes are likewise considered, and the author states that every abnormally contracted sphincter is pathologic and a cause of constipation. The statement is made that chronic infections of the rectal outlet have their origin in early infancy when the digestive apparatus remains deranged for a long period, or in some acute intestinal disease, such as typhoid fever, amebic infection, so-called flux, hookworm disease, and other infections. These conditions leave in their wake enterocolonic lesions, with bands,

⁹⁰ Journal of the American Medical Association, November 3, 1917, lxix, 1513.

veils, and adhesions. Mention is made of ileocecal insufficiency, this is recognized as being more frequent than was formerly supposed. One out of 6 patients showed the condition.

Intestinal Toxemia. DIET IN INTESTINAL TOXEMIA. Satterlee⁹¹ states that the question of diet is most important in chronic intestinal toxemia:

(a) On account of the close association with, and danger of, intestinal putrefaction, it is necessary to withdraw all meat protein except that contained in milk, cream and butter. This includes all eggs, meat, fish, shellfish, and meat extracts. After a reasonable time, say three months, an egg and a little bacon is allowed, and the patient is watched for symptoms. Meat can then be added gradually if the grade of toxemia is a mild one. Relapses should always be treated by a complete withdrawal of meat.

(b) Prohibit all white refined flour and substitute whole wheat. The white flour of today is so highly refined that the nutritious substance (so-called "vitamines") and salts, so necessary for proper metabolism, have been removed. Prolonged eating of this white flour has shown bad results in intestinal toxemia, and it constipates. Polished rice should be placed in the same class and forbidden, non-polished and uncoated rice being substituted. If starch digestion is poor, it is necessary to eat large quantities of these two articles. There are numerous difficulties in this dietary of whole wheat products which are to be overcome. I usually divide the patients into two classes—those who eat at home, and those who eat in restaurants. Those in the former class have a much better chance than those who roam around for their meals. We often cannot spend much time on this class unless they will eat in certain specified restaurants, where the dietary is cared for. Whole wheat flour does not keep well and is subject to parasites. It is not always easy to obtain. One reason of this is that it is not popular, as the public have not been educated as to its worth, and it is not considered as palatable as the white flour. This can be overcome by the education of our cooks, who can be taught to make delicious cakes, waffles, griddle cakes, biscuit, gravies, sauces, etc., with the whole wheat flour, with but a small addition of white flour, if necessary. If we would watch our cooks, we would be amazed at the large quantities of white flour used in the preparation of our food.

Oatmeal and whole wheat cereals should be used freely; among the latter the old-fashioned cracked wheat is being revived, and is an excellent substitute and a welcome change for the tired palate. The various proprietary and ready-prepared cereals are, generally speaking, poor

foods, especially as all food should be thoroughly cooked.

The modern corn products are also pernicious. Wood says that they are low in nutritious substances, especially fats and phosphorus pentoxide, which is a reliable indicator of the so-called vitamine so essential to nutrition. In the place of these, we should use the old-fashioned corn-meal containing the sperm. Wood says that foods containing large amounts of finely milled flour should be classed as furnishing a "deficiency diet."

(c) Vegetables. Green vegetables are very important in the dietary. One factor in the improvement of our patients during the summer months, I believe, is the abundance of this class of foodstuffs. Fresh vegetables are to be preferred to the canned, but cannot always be obtained throughout the winter months except in the large cities, where the small venders are of great value. I have tried in vain to get fresh vegetables in the country towns during the winter and have had to have them shipped from the city. It is possible to obtain them if we take the trouble. Dried vegetables are excellent. The large hotels, however, feed their guests largely on canned goods for reasons best known to themselves. I have had as patients head waiters in some of our best known hotels, who inform me that they cannot obtain in the hotel restaurant the simple diet recommended. In certain instances the manager of the hotel has taken the trouble to place the diet within reach. The real reason of this condition, is, of course, the lack of public interest, and insufficient demand for the "simple life." In the choice of fruit and vegetables, we must be guided by our idea of the condition of metabolism in the patient. A chemical blood analysis is necessary, or at least a great help, in determining the amount of sugar excess or retention. In cases of flatulent dyspepsia due to carbohydrate intolerance, or where the blood-sugar is above the normal limit, it may be necessary to restrict the vegetables to the class commonly designated as the 10 per cent., and 5 per cent. (carbohydrate) vegetables, or in diabetics to the 5 per cent. vegetables alone. These are special cases where the diet has to be very carefully arranged.

Ordinarily, the list of vegetables, all well-cooked, include string beans, young lima beans, spinach, asparagus, Brussells sprouts, beet-tops, kale, rhubarb, mushrooms, parsnips, turnips, celery, and celery knobs, carrots, beets, squash, artichokes, cauliflower, and potatoes, white or sweet. Vegetable salads are useful to vary the monotony. They should be made with well-cooked vegetables and lettuce, endive, etc., and dressed with oil (olive) and lemon juice in the place of vinegar, which may be a gastro-intestinal irritant. Macaroni, spaghetti and noodles, unless made from the whole wheat flour, are not permitted. In severe grades of intestinal toxemia, the vegetable fats and oils should be substituted for the animal products, as butter and cream, and are indicated when fats are needed

for metabolism or for constipation.

(d) Fruit. Cooked fruit should be eaten at least twice and usually three times a day. Unless there is carbohydrate intolerance, the best fruits are apples, prunes, pears and peaches, preferably fresh, but may be dried. Raisins, cherries, apricots, cranberries, huckleberries, strawberries, raspberries, bananas—all cooked and preferably fresh—have their usefulness unless some idiosyncrasy exists. Of the uncooked fruit allowed are oranges, lemons, grapefruit, melons, unless some special reason exists for their being withheld. In glycosuric conditions, we must limit the fruit to the 5 per cent. or 10 per cent. (carbohydrate) fruit as indicated.

(e) Nuts are welcome additions to the diet and are usually well tolerated unless gastric digestion is very poor or some idiosyncrasy exists.

These are walnuts, hickory nuts, pecans, Brazil nuts, peanuts, beech nuts, pine nuts and almonds. These may be made up into bread, cakes, or desserts. They may be home ground in inexpensive mills which also grind wheat and corn. The 10 per cent., or 5 per cent., nuts should be

carefully followed in glycosuric conditions.

(f) Milk Products. Milk is one of the most useful and often indispensable articles of diet. Sometimes it is contraindicated, as when an idiosyncrasy exists or when it is constipating. Bacterial content has much to do with tolerance. Buttermilk or fermented milks will often counteract these effects. Sour milk, or sour milk cheeses, are very useful through their lactose content, as shown by recent experiments of Hull and Rettger. Rennet is a very digestible and useful product. The cream cheeses are not so efficacious, and the hard cheeses, such as American, Roquefort, Camembert, Swiss and Dutch cheese, etc., are contraindicated on account of the tendency to constipate. Cream is usually well borne, and, in 20 per cent. strength, can be taken up to one-half pint per day; it is of aid in constipation.

Sugar is necessary, and will make up for some of the calories lost by the reconstructed diet. Brown sugar or molasses helps constipation. Tea and coffee are allowed in moderation, provided no contra-indications

exist. Cocoa or cereal coffee may have to be substituted.

In choosing vegetable foods, it is interesting to consider those that have a high percentage of ash, the most important of which are phosphorous pentoxide, calcium oxide, and iron. According to the statistics of Henry C. Sherman, their order of value in percentage of edible portion is as follows: Rye and wheat bran, dried beans, cocoa, caraway seed, dried peas, almonds, peanuts, chocolate, oatmeal, rye flour, dried sweet

corn, gooseberries, vanilla bean, and cottage cheese.

According to the percentage of 100 calories, the following articles lead: Celery, canned vegetable soup, spinach, mushrooms, lettuce, leeks, pumpkins, rhubarb, asparagus, dried beans, cowpeas, string beans, turnips, tomatoes, dried peas, fresh peas, cauliflower, and lima beans. The white potato is placed way down the scale chemically, but practical experience in Europe during the war has demonstrated that it is the most necessary of vegetable foods and cannot be wholly replaced by any other one vegetable. The potato should be baked or boiled in the skin, otherwise large amounts of the salts are lost in the water. This could be saved, however.

Among the foods rich in carbohydrates which should be avoided in marked flatulent dyspepsia, are, in their order of carbohydrate content: Cornstarch, tapioca, hominy, rice, farina, oats, and prunes. Gelatine, being high in animal protein, should not be used. Alcohol in any form is not to be used, as it is a gastro-intestinal irritant.

AUTO-INTOXICATION IN CHRONIC CONSTIPATION. Soper⁹² points out the great similarity between the symptoms attending focal infection and those which are seen in auto-intoxication. This similarity suggests to him the bacterial origin of auto-intoxication, in other words, the

²⁸ Journal of the American Medical Association, November 3, 1917, lxix, 1511.

idea of bowel infection. Clinicians have maintained that constipation per se could not be considered as a disease entity, inasmuch as many normal individuals have a movement only twice a week. It seems to be the conclusion of many excellent observers in this line, that a diseased intestine is really necessary for the symptoms incident to chronic constipation. Soper claims that our first important duty is to isolate focal infection in the teeth, tonsils, nasal sinuses, genito-urinary system, and the intestine itself, and even the lower rectum, and colon. We must, furthermore, be prepared to admit that toxemia can result from chemical changes in the intestinal contents. In this connection anaphylaxis must be considered, as well as the abnormal metabolism of food protein. The value of a low protein diet is mentioned, as well as the fact that carbohydrates, such as cane-sugar, can be instrumental in producing deficient metabolism of protein. The indiscriminate use of cultures of the bacillus bulgaricus is considered as being open to serious objections, inasmuch as the studies of Herter and Kendall, Raehe, Rettger, Hoerten, Hull, Einhorn, Wood, and Zublin, and Rosenberg, have shown the fallacy of attempting to secure implantation of the Bacillus bulgaricus in the intestinal tract. Furthermore, the use of purgatives is interdicted.

Conclusions. 1. Treatment should be directed to any infectious

agent.

2. Reliance should not be placed on Bacillus bulgaricus.

3. The regular use of cathartics and water enemas should be avoided.

4. An initial radical change should be made in the dietary in an attempt to alter the bacterial flora.

5. The problem of the restoration of colonic function may demand the employment of all our therapeutic resources, medicinal, dietetic,

hygenic, and surgical.

RECTAL CONDITIONS IN CHRONIC CONSTIPATION. Graham⁹³ claims that no case of chronic constipation should ever be treated until a through proctological examination has been made. The rectum may be found distended with feces, the patient being utterly insensitive to them, so that the rectal stasis is atonic. In every instance a digital examination should be made, so that, if the rectum is empty, it can be assumed that stasis is higher up. Ulcerations in the neighborhood of the rectum naturally produce an irritable sphincter. Matthews maintains that many cases of constipation are the result of spasm or hypertrophy of the external sphincter; hypertrophy of the levator muscles and the ani muscles, according to Gant, may result from chronic pelvic, uterine, vesical, and rectal diseases, which, by contracting the sides of the rectum, induce constipation. Such a case Graham has never seen. Hypertrophy of the circular muscle fibers of the intestines at the junction of the sigmoid and rectum may also be a factor, but this is rare. In every case the valves of Houston should be examined, as they can be abnormally enlarged or inflamed. Hemorrhoids, both external and internal, are likewise the cause, either through their size or the irritation they induce. Intra-intestinal tumors, such as polypi, adenomas, papil-

⁹³ Journal of the American Medical Association, November 3, 1917, lxix, 1515.

lomas, and fibromas, seldom attain sufficient size to obstruct the fecal current. Indirectly, they may cause spasm of hypertrophy. Cicatricial or malignant stricture of the rectum, foreign bodies, fecal impaction, extrarectal conditions, such as enlarged prostate, stone in the bladder, urethral stricture, uterine and ovarian tumors, uterine displacements, pelvic and inflammatory disease, perineal lacerations, rectocele and deformities of the coccyx can be the cause of the disease. Retroversion of the uterus can partially block the rectum, interfere with the normal muscular movements and diminish its expulsive force. Stone in the

bladder and urethral diseases may produce sphincter spasm.

His conclusions are as follows: (1) No case of chronic constipation is diagnosed correctly, or should ever be treated as such, until a thorough proctologic examination has been made; (2) the same and identical rectal condition may cause constipation in one patient, and have no appreciable influence in retarding the feces in another; (3) in many cases proctological examination alone will not determine positively that constipation has its origin in rectal conditions. It must be supplemented by a careful roentgenographic and fluoroscopic study of the alimentary tract. Such a diagnosis ensures the patient correct treatment and satisfactory results; (4) rectal conditions are frequently the primary causative factor of chronic constipation. On the other hand, constipation may be the cause of various rectal conditions. Whether the cause, or the result, of chronic constipation, the appropriate treatment of rectal conditions is essential if a cure is to be effective.

Chronic Intestinal Toxemia. Satterlee and Eldridge⁹¹ review the nervous symptoms attending chronic intestinal stasis. For purposes of simplification, they divide the nervous symptoms attending chronic intestinal toxemia into four groups: (1) The mental system, (2) the sensory system, (3) the motor system, (4) the sympathetic system. These groups may merge into one another, and it is not clear as to why the toxemia accompanying intestinal toxemia should exhibit a special affinity for certain parts of the nervous system. The authors point out, in proof of their contention, that the symptoms of a great many of these patients have been improved or have disappeared altogether through treatment of the intestines.

They divide the mental group into two subdivisions: Intellectual, and psychic. Under the intellectual group are classified sluggishness of memory, dulness and stupidity, loss of concentration, loss of memory, and mental incoördination. In the psychic group are included irritability, lack of confidence, excessive and useless worry, exaggerated, introspection, hypochondriasis, phobias, depressions, melancholy, obsessions, delusions, hallucinations, suicidal tendencies, delirium and stupor. Of the 518 cases studied for this paper, 201 exhibited irritability, 317 depression, 4 obsessions, 1 dual personality, 5 hallucinations, 4 delusions, 12 hysterical coma, 74 deep melancholia. There is no group of diagnostic signs characteristic of intestinal toxemia.

The sensory symptoms may be classified as paresthesias, hyper-

⁴ Journal of the American Medical Association, October 27, 1917, p. 1414.

esthesias, anesthesias, hyperalgesias, analgesias, myalgias, neuralgia, neuritis, perversions of taste and smell, hypohedonia, and hyperhedonia. In the 518 tabulated cases, 421 complained of headache, 302 of vertigo, 397 of paresthesias, 387 of myalgia, 379 of "nervousness" and "nervous sensations."

The third class, or those exhibiting disturbances of the motor system, are fewer in number. They include the so-called intestinal epilepsies, and those resembling tetany. The symptoms relative to the sympathetic system are numerous and extensive. For purposes of classification, they may be divided as follows: (1) Cardiac symptoms—including tachycardia and palpitation; (2) peripheral vasomotor symptoms, such as diminished blood supply to the skin, dry and brittle nails and hair; (3) gastro-intestinal symptoms, including disturbances in taste and smell, appetite, nausea, vomiting, changes in secretion, constipation and diarrhea; (4) disturbances in the endocrine system, with hypothyroidism, hyperthyroidism, alteration in the secretion of the suprarenals, and other glands of internal secretion.

These authors cite cases illustrative of the various conditions. Their conclusions are as follows: The nervous system is almost invariably affected in whole, or in part, by chronic intestinal toxemia. The nervous symptoms are often the most prominent symptoms connected with the case. If the obvious nervous factors can be excluded, a careful study of the gastro-intestinal tract should be made. Disturbances of the gastro-intestinal tract are more often the cause of nervous symptoms than the result of a diseased nervous system. In doubtful cases, a proper hygiene and therapy of the gastro-intestinal tract will often be the deciding

factor in the differential diagnosis.

Intestinal Stasis. Colon Stasis. Kellogg⁹⁵ discusses the question of colon stasis, and is a believer in the medical rather than the surgical treatment of this condition. In 40,000 cases with more or less stasis seen at Battle Creek in the last ten years, he has performed colectomy on only 20, an extremely small percentage. He takes the point of view shared by most observers that the colon, instead of being a useless appendage, is in reality an organ of decided physiological importance.

(I cannot understand how this idea could have permeated the minds of a certain group of medical men. In fact, the absorptive power of the colon is too well-known to merit description, more than this the conversion of bilirubin, the terminal digestion of cellulose, the absorption of certain of the amino-acids must certainly take place in the ascending

colon.)

Kellogg suggests the following measures for the relief of stasis: (1) A diet whose outstanding features are low protein and high cellulose, namely, a diet of fruit, cereals, and vegetables; (2) the free use of different substances, such as agar or bran at every meal; (3) the use at every meal of one-half an ounce to three times that amount of mineral oil; (4) abdominal exercises and massage; (5) in very obstinate cases, large amounts of bran and fruit, in fact, just as much as the patient can

⁹⁵ Journal of the American Medical Association, June 30, 1917.

comfortably ingest. Lettuce, celery, and tomatoes are all useful, and fruit may be taken ad libitum; (6) at first, enemas of 80° F. may be used; furthermore, the patient is directed to go to stool on arising and after each meal; (7) in the spastic type of lower colon condition, the patient is given hot saline enemas containing several ounces of cultures of the Bacillus bulgarieus and the Bacillus bifidus to which is added a small amount of malt sugar and boiled starch, the idea being to bring about a change in intestinal bacteria; (8) when the lower bowel has lost its sensibility, various measures may be used, such as an electrode in the rectum, the use of very weak solutions of hydrogen peroxide (0.25 per cent.), solutions of citric acid (0.25 to 0.5 per cent.), mixtures of equal parts of carbon dioxide and pure oxygen gas, etc.; (9) when there is atrophy from inflammation of the lower colon, considerable relief will be afforded by the introduction of such substances as equal parts of paraffin and liquid petrolatum which will melt at the body temperature; (10) the wet girdle, or Priesnitz compress, worn at night.

This resumé of medical treatment is well worthy of thought, and, in selected cases, will accomplish a great deal. It must, however, not be applied indiscriminately. In fact, the treatment of constipation should follow, and not precede, an intelligent diagnosis. While it is true that the majority of functional forms of constipation will yield to the above measures, there are many cases in which magnesium sulphate applications or the use of atropine with mild laxatives, in spastic cases, will accomplish better results. In still another obstinate group-largely the mechanical type—only high recurrent irrigation will afford relief.

Migraine and Intestinal Stasis. Einhorn⁹⁶ discusses the relationship between these two conditions, and mentions the frequency of migraine, dizziness and headache in the various forms of chronic constipation; however, the interesting point in this article is the method of treatment which the author adopts. He points out that it is necessary, as is well known, to correct any underlying fault that is in the system.

Apart from this he recommends the following procedures:

During the attack, the desired rest must be secured for the patient; if possible, in bed. No nourishment should be taken, or only very little liquid food; and a mild aperient or a saline enema should be given. If these measures are not sufficient, citrated caffeine, 2 grains, in conjunction with paramidon, 5 grains, may be administered twice daily. In rare instances, codeine or morphine may be required. All of these remedies act well and should be given as needed. Calomel is good, and can be administered when indicated, and injections may be given to wash out the bowel. In a day or two the migraine is over and the patient returns to normal, and then we decide about other measures to adopt to prevent, if possible, the return of migraine. If we succeed in eliminating all the causative factors, the migraine will not reappear; but, if we cannot do that, we can at least cause the attacks to be milder and less frequent.

^{*} Journal of the Americal Medical Association, October 20, 1917, lxix, 1315.

Constipation in many instances is due to a one-sided diet, but the author urges plenty of bread, vegetables, fruit and solids. In fact, the author makes the surprising statement that the more indigestible food these patients take the better. His statements are open to criticism, inasmuch as it is evident to any clinician that constipation alone is not the whole explanation of migraine. It is probable that there are many complicated chemical facts at the bottom of it, as well as the question of anaphylaxis. Regarding the question of cathartics and laxatives, he simply mentions the well-known combination, including the use of the combined agars, such as phenolphthalein agar, and rhubarb agar; olive oil injections are mentioned in cases of spastic constipation.

Fecal Signs of Gastric Insufficiency. Goiffon 97 reviews in detail the fecal picture of gastric insufficiency. This condition he considers more common than is generally believed, and the microscope shows connective tissue, undigested meat and potato cells. The characteristic findings are subacidity or achylia; the appearance of the stools which are dark brown or black externally, much lighter internally; in other words when the movement is indented with a glass rod, and the bile pigments are oxidized on the exterior of the movement, he ascribes it to intense putrefaction. Hydrochloric acid is given in doses of 1.5 to 3 grams a day. Matthew used to prescribe one to three teaspoonfuls of a mixture of 20 grams of hydrochloric acid in 180 grams of distilled water. This dose was added to a glass of sweetened water into which was mixed the white of one egg.

Appendicitis. Appendicitis and Oxyuriasis. Matthiasoon⁹⁸ states that he found a living oxyuris in the appendix of three adult women. In each case the appendicitis was mild and restricted to the interior of the organ. All of them complained of boring pains in the right iliac fossa for several months before the first attacks. This author believes that the premonitory symptoms were due to the parasites, and suggest the importance of these organisms in producing symptoms. He found naphthalin more effectual than santonin in getting rid of the worms.

ACUTE APPENDICITIS. Nicoll⁹⁹ discusses the subject of acute appendicitis in detail. He reviews the contention of Aschoff that there is no such thing as a primary catarrhal inflammation of the appendix, but there is always a primary point of infection in the subepithelial layer of the appendix. As a rule, a number of these primary foci of infection are formed. Following this line of reasoning, the following possibilities occur:

1. A primary lesion, single, (a) may undergo resolution, with resulting microscopic, subepithelial scar; or (b) may ulcerate by the destruction of overlying mucous membrane, with the following result: Resolution and formation of microscopic mucous membrane scar, or continuation of the inflammation with production of a chronic catarrhal or ulcerative process of microscopic size. (c) The single lesion may progress to the

⁹⁷ Archives des Maladies Digestif, Paris, June 9, 1917, No. 9, pp. 229–296. Hospitalstidende, Copenhagen, August 15, 1917, Ix, No. 33, 789.
New York Medical Journal, July 14, 1917, p. 63.

serosa, with the result that microscopic perforation occurs, with attend-

ing infection of the peritoneal cavity.

2. A primary lesion, (a) may remain as multiple discrete lesions, that may undergo any of the changes indicated above in subdivisions a, b, or c, except that the resulting pathology is multiple instead of single. (b) The primary lesions may coalesce, forming lesions which may undergo any of the changes of the single lesion indicated in the former divisions, except that the resulting lesion will be macroscopic in size. (c) In either a or b the process may spread to the mesappendix and there involve the blood vascular elements, the veins, producing thrombosis, with resulting hemorrhagic infarct and large perforations the result of widespread tissue necrosis.

In further explanation it may be well to say that while the primary lesions are likely to be multiple, it is quite conceivable that in any given inflamed appendix we may find evidences of both the discrete lesion and the coalesced lesion, and that this combination of the two varieties would be the condition most likely to be met with in inflammation of any

marked extent.

To sum up, Aschoff's teaching about the primary infection, in the majority of cases, are these: (1) The primary lesion is located in the appendix itself. (2) The appendix does not become involved in inflammation as the result of the extension to it of inflammation of the mucosa of neighboring parts of the gastro-intestinal tract. (3) The appendix, once involved by intrinsic inflammation, never returns to normal, but remains either in a state of chronic inflammation, or is permanently injured and distorted by the healing process which follows upon the heels of the acute attack of inflammation.

"As a rule, the appendix is found in the right iliac fossa pointing upward and inward, upward and outward, or downward and inward. Disease may distort it and alter its position, and adhesions may bury or obscure its normal relations or outlines. Two positions are of importance because of their influence upon diagnosis and operative removal, the so-called retrocecal or retrocolic position, and the pelvic position. In the retrocecal or retrocolic position, which is found in from 10 to 15 per cent. of all cases which come to operation, in my experience the appendix lies close to the cecum or colon, usually firmly attached to the posterior abdominal wall or the large intestine, and usually both, and is overridden by the inflamed cecum or colon. This position of the appendix may occur either lateral to the cecum or colon the usual position—or mesial to it. Its chief interest in this position lies in the fact that there is danger of confusing its symptoms with those originating in a diseased gall-bladder or kidney, and also in the fact that operation is rendered slightly more difficult. In the pelvic position the appendix points almost directly downward, and is wholly or in great part within the pelvis proper, and so in relation with the pelvie peritoneum whose reaction to inflammation differs somewhat in symptomatology from the peritoneum of the general abdominal cavity."

The exciting cause is given as always a bacterial infection which in

most cases is a form of the streptococcus which is soon superseded by the pyogenic forms of cocci, the colon organism, pneumococcus, etc.

Regarding the *symptomatology*, pain, nausea and vomiting, tenderness and rigidity, temperature and increased pulse-rate, leukocytosis, and eventually a mass comes into consideration. It is pointed out that the pain, which is almost always cramp-like, commences in the epigastrium and then gradually becomes localized in the right iliac fossa. Sudden cessation of pain, with the absence of general evidences of improvement is a bad sign. The changing of localized to general pain is a sign of spreading peritonitis. Primary nausea is differentiated from the later persistent nausea and vomiting of peritonitis. Mention is also made of the fact that vomiting is likely to be absent in patients whose appendices occupy the pelvic position.

Tenderness, at first general, is soon localized. It is usually, according to the author, about an inch below the points of McBurney and Munro, which points indicate the position of the ileocecal valve. In retrocecal positions of the appendix, the point of tenderness can be found about half way between McBurney's point and the free border of the ribs "a little too high for the appendix, a little too low for the gall-bladder,

and not enough back for the kidney."

Rigidity the author gives as the mainstay for the diagnosis and should be tested by light palpation over the right rectus and comparison made with the left.

Initial high temperatures and chills, the author looks upon with suspicion, inasmuch as both may indicate trouble elsewhere (chest, etc.). A sudden fall in temperature is a bad sign, indicating, in many instances, gangrene and perforation. Regarding the increase in pulse-rate, the pulse gains on the temperature and the pulse rise often precedes it; in fact, the statement is made that the pulse gains fifteen or twenty

beats on the temperature.

The author considers *leukocytosis* very important and states that the total count should be compared to the polymorphonuclear count or percentage. A falling total count, with a rising percentage, is of bad prognostic import. A mass he considers a positive indication of appendicitis, but says that it occurs very rarely within the first sixty hours. This statement, as many of the others, must be accepted with considerable caution, inasmuch as a mass can arise in an extremely short time.

Beckman, Smith, and Everingham¹⁰⁰ give a resumé of 500 cases of acute appendicitis. The statement is made that acute appendicitis, from a condition whose death-rate is approximately that of typhoid fever, has been reduced to one with a mortality of only 1 per cent. if operation is done within the first twenty-four hours. By the end of the second day, the mortality has quadrupled, although still considerably below the general average. By the end of the third day, the mortality has passed far above the general average, almost as high a figure as is attained at any time.

¹⁰⁰ American Journal of the Medical Sciences, October, 1917, clvic, p. 490.

114 DISEASES OF THE DIGESTIVE TRACT AND ALLIED ORGANS

ABI	Ι.

Day of illness operated upon. First							Number cases. 111 109 89 69 39 33 33 13	1	Deat 1 4 10 5 5 4 3	hs.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	rtality, cent. 0.9 4.0 1.0 8.0 8.0 2.0 9.0
Diffuse peritonitis Diffuse peritonitis wit Diffuse peritonitis wit Diffuse peritonitis wit Prolonged sepsis and Sepsis Septicemia and pneur Subphrenic abscesses Pneumonia Pulmonary embolism Alcoholism Facial erysipelas	th left th mu th pn fecal monia	t ilia iltipl eum fistu	c ple livonia	nleb ver	oitis abs	ces	d pleuris	y . pleuri	sy		 	18 1 1 1 3 1 1 2 3 1 1

TABLE III.

1 34

Abscess.			Incidence, per cent.	Cases.	Mortality.
Abscess			21.0	107	5.6
Diffuse peritonitis			9.0	45	47.0
Tuboövarian abscess			0.4	2	
Acute cholecystitis (suppurativ	7e)		0.4	2	50.0
Obstruction due to adhesions			0.2	1	
Salpingitis			0.2	1	
Toxemia of pregnancy			0.2	1	100.0
Alcoholism			0.2	1	100.0
Pulmonary tuberculosis .			0.2	1	100.0
Nephritis			0.2	1	100.0

The postoperative sequelæ were:

	1	ABI	ъĿ.	IV.				
Scquelæ.						ncidence, er cent.	Cases.	Mortality, per cent.
Fecal fistulæ						5.0	24	17
Pneumonia						2.5	12	33
Infected wounds in undrained	l ca	ses				2.5	$\overline{12}$	0.0
Secondary peritoneal abscess,							12	
							10	40
subphrenic . Pleurisy (one suppurative)		~	٠		۰	0.6	3	- 0
District (one suppurative)				*	٠	0.0		66
Phlebitis							2	.5()
Early ventral hernia						0.4	2	50
Facial erysipelas						0.4	2	
Tonsillitis						0.4	9	
Rheumatism						0.4	9	
Alveolar abscess						0.4	$\tilde{2}$	
							-	100
Pulmonary embolism						0.2	1	100
Septicemia						0.2	1	100
Ileus paralytic (operated) .						0.2	1	
Liver abscesses						0.2	1	100
Parotitis						0.2	1	•
TO 2 1 . 1						0.2	1	
						0.2	1 1	
Pulmonary edema (slight) .						0.2	1	
Abscess of neck						0.2	1	
Acute mania						0.2	1	

In the discussion of diagnosis, vomiting occurred in four-fifths of cases, moderate temperature occurred in the average case, while high temperatures were accompanied by higher mortality. The pulse-rate was often of more value in diffuse peritonitis, four-fifths had a pulse of 100, or more, at operation, and, of the remaining one-fifth, the majority were between 95 and 100.

			TAI	BLE	v		
Pulse at operation.						Percentage of cases.	Subsequent mortality.
Under 100 .						. 45	3.6
100 to 120 .						. 31	8.3
120 and over						. 23	11.0

They come to the conclusion that it is impossible to make a diagnosis from the symptoms present, a severe case often showing the least marked signs.

Rectal Feeding. Cornwall¹⁰¹ gives the following prescriptions for rectal feeding.

Prescription 1. This prescription supplies daily 20 gm. of protein, presumably in the form of amino-acids, to the value of about 700 calories, salts, and vitamins, and water to the amount of about 50 ounces.

At 6 a.m. a mixture consisting of glucose, 1 ounce; strained juice of one-half orange; sodium bicarbonate, 30 grains; sodium chloride, 30 grains, and water to make 10 ounces, is injected.

At 8 a.m. 5 ounces of skimmed milk, thoroughly peptonized and pancreatized, are injected.

At 12 M., the same as at 6 A.M.

At 6 P.M., the same as at 8 A.M.

At 10 P.M., the same as at 6 A.M.

At midnight, the same as at 8 A.M.

Every second day, 4 A.M., a colonic irrigation with physiological sodium chloride solution is given, and the glucose enema at 6 A.M. is omitted.

Modifications of Prescription 1. The quantity of the glucose enemas may be reduced to 8 ounces.

The amount of the glucose in the glucose enemas may be reduced to one-half or two-thirds of an ounce.

The amount of the glucose enemas may be increased to 12 or 16 ounces with, or without, an increase in the percentage of glucose.

A quarter of an ounce of glucose may be added to each milk enema. The glucose enemas may be omitted altogether, with, or without, substitution of drink enemas of physiological sodium chloride solution. Calcium chloride, 5 grains, may be added to each glucose or drink enema.

A culture of acidophilic bacteria may be added to any of the enemas as specified.

Prescription 2. This prescription supplies daily fuel to the amount of about 700 calories, salts, and vitamins, and water to the amount of 60 ounces, but no proteins.

¹⁰¹ Journal of the American Medical Association, No. 20, lxx, p. 1451.

At 6 a.m. a mixture consisting of glucose, 1 ounce; the strained juice of one-half orange; sodium bicarbonate, 30 grains; sodium chloride, 30 grains, and water to make 10 ounces is injected.

At 10 A.M., the same as at 6 A.M.

At 2 P.M., the same as at 6 A.M.

At 6 P.M., the same as at 6 A.M.

At 10 P.M., the same as at 6 A.M.

At 2 A.M., the same as at 6 A.M.

Modifications of Prescription 2. The same modifications may be made of the enemas in this prescription as of the similar glucose enemas in prescription 1.

The sodium bicarbonate in the enemas may be increased, even to 60

grains.

The orange juice may be temporarily omitted. Calcium chloride may be added to the enemas.

The enemas should be introduced at a temperature of 100° F., and slowly, the patient's buttocks should be elevated and he should lie on his right side for an hour after the injection.

Ileus. Langer¹⁰² reviews the subject of ileus and divides it into three

types: Adynamic, dynamic, and mechanical.

ADYNAMIC LEUS is the type due to atonic paralysis of the musculature of the bowel. It is accompanied by a total absence in peristalsis, and is the type most commonly encountered after operation. The causes producing this condition are: (1) Localized septic peritonitis; (2) general septic peritonitis; (3) prolonged violent handling of the gut; (4) prolonged exposure of the gut; (5) severe traction of the mesentery; (6) prolonged efforts at taxis; (7) in case of endocarditis, embolism of the superior mesenteric artery, with sudden onset and fatal termination; (8) thrombosis of the mesenteric veins following, for instance, hemorrhoidal operations, and purulent appendicitis with a sudden onset, probably less so than in the preceding instance, but not less fatal; (9) adynamic ileus from reflex action, most frequently seen in pneumonia, occasionally in diaphragmatic pleurisy; (10) spinal cord lesions.

This author believes that the pre-operative use of the Bulgarian bacillus is of value in preventing this form of the disease. He also believes in the value of morphine, $\frac{1}{6}$ gr. combined with $\frac{1}{60}$ gr. strychnine,

following operation.

In the treatment of adynamic ileus, he uses the so-called 1-2-3 enema, and the S. S. enema; the 1-2-3 being 1 oz. of magnesium sulphate, 2 ounces of glycerine, and 3 ounces of water; S. S. is, of course, the soapsuds enema. The ox-gall enema, 3 drams to a pint of water, or the alum enema, 3 drams to a pint of water, is also popular. The ordinary molasses enema has also proved efficacious when other means have failed. Gastric lavage is the treatment for emesis. Mention is made of electric massage with the galvanic current.

Eserine, $\frac{1}{60}$ gr. every two hours hypodermically, is the German method, while atropine, $\frac{1}{60}$ gr. every two hours, is of value. During the last two

or three years, however, the author has placed considerable dependence on pituitrin, an ampoule hypodermically every three or four hours.

Dynamic Ileus is due to excessive peristals or a spastic contraction of the gut, and is most frequently met with in lead poisoning; tyrotoxicon poisoning, as found after ingestion of spoiled milk or ice-cream,

is also responsible.

MECHANICAL ILEUS, from the standpoint of the surgeon, is the most promising. In a study of 1000 cases by Gibson, 35 per cent. were due to strangulated hernia, 19 per cent. to intussusception, 19 per cent. to adhesive bands, 12 per cent. to volvulus, and the remaining 15 per cent. were divided among the other causes of mechanical ileus. Strangulation numbers a great many cases, most frequently in the neighborhood of the ileum owing to its relation to the hernial crifices, the appendix, and the frequency of Meckel's diverticulum. Not merely inguinal and femoral hernia must be considered, but also femoral, umbilical, the so-called hernia of Treitz into the duodenojejunal fossa, and diaphragmatic hernia.

Intussusception is most frequently found in infancy, 70 per cent. occurring in the first year of infancy, 52 per cent. at the ileocecal valve, 20 per cent. are enteric, small gut into small gut, and about 10 per cent. are colic.

In another group, obstruction is produced by obturation closed either by blocking from within, with tumors, etc., or from without by cicatrices due to syphilis and tuberculosis, foreign bodies such as enteroliths, gall-stones, or fecal impactions. Carcinoma and neighboring tumors from without can produce obstruction.

DISEASES OF THE PANCREAS.

Pancreatic Secretion. Experiments conducted by Mann and Mc-Lachlin¹⁰³ have shown that while epinephrin markedly increases blood-pressure, it also inhibits pancreatic secretion. Small doses decrease the activity of the pancreas whether or not they have the action on the blood-pressure. According to these authors, epinephrin also decreases pancreatic volume, at the same time it also decreases pancreatic flow. While this is not stated, it would appear that the reduction of the secretion is dependent upon the amount of blood going to the pancreas. The experiments of these authors tend to indicate that the pancreatic vessels are more sensitive to the reaction of epinephrin than those of any other region concerning which we have this information.

Pancreatic Diabetes. Hardoy¹⁰⁴ reports a case of pancreatic diabetes in a young man, aged twenty-one years, which was believed to be due to inherited syphilis. The diabetes was accompanied by a very high azoturia and glycosuria, as well as great prostration. Hardoy attempted some experiments to ascertain whether the sympathetic or vagus system was involved. The test showed a positive reaction for vagatonia. He therefore administered pilocarpine, the effect being just as he surmised. But, as the nervous system became habituated to the

 $^{^{103}}$ Jour. Pharm. and Exper. The rapeutics, October 10, 1917, x, 251. 104 Revista de la Assoc. Med., Argentina, Buenos Aires, 1917.

use of pilocarpine, the effect became constantly less. At that point he began vigorous specific treatment, and the sugar disappeared from the urine. To confirm these conclusions, he brought on a glycosuria by a change in diet, and banished it as readily with pilocarpine. He also insisted upon the necessity for making a careful search for syphilis in every case of diabetes.

Acute Pancreatitis. Morton 105 mentions 3 interesting cases of this disease. The first one is especially so, inasmuch as the abdomen was opened and some fat necrosis found, yet, on examination of the pancreas, no definite abnormal condition of the organ could be found. It was not until postmortem, after removal of the pancreas, that it was discovered that the disease was confined almost entirely to the middle of the organ, so that external examination or inspection failed to reveal evidence of the disease. The second case was of interest, because of fecal vomiting. The third case was of interest because the patient had almost recovered, only to have a recurrence of serious symptoms, followed by death. This case was probably due to retention of gall-stones in the common duct. In all three of these cases there was a history of recurrent pain in the upper abdomen, unaccompanied by jaundice, yet 2 of the 3 cases had stones in the gall-bladder. An interesting question that arises in this connection is that of recurrent upper abdominal colic in the absence of biliary or pancreatic calculi. That this occurs is unquestionable. The exact mechanism by which this is brought about is not clear, but the probabilities are that a spasm can take place in the ducts, due to simple inflammatory conditions.

The Effect of Pancreatic Secretion on Gastric Acidity. Gray, 106 by means of a diversion of the pancreatic juice from the duodenum into the stomach, studied its effect on gastric acidity. From these studies it appears that early in digestion there is comparatively little change, but, in the later stages, a moderate decrease in acidity, which confirms the views of Boldyreff. These studies also demonstrated that it is possible to transplant the larger pancreatic duct into the stomach and maintain it patent for months. In animals in which operative procedure has been carried out, the pancreas was found to undergo no inflammatory or degenerative changes.

The literature regarding the automatic regulation of gastric acidity by means of the regurgitation of the pancreatic secretion is steadily increasing, and there is now no doubt as to the importance of this mechanism. Not only is this a normal compensatory factor but it is probable, from experiments performed at the physiological laboratories of the Jefferson Medical College, that the rest-period following gastric digestion is probably largely influenced by this factor.

DISEASES OF THE GALL BLADDER, BILE PASSAGES AND LIVER.

Gall-stones. Ethology. Rosenbloom¹⁰⁷ discusses the etiology of gall-stones. This is particularly important at a time when the various

Bristol Medical Chirurgical Journal, July, 1917, xxxv, 80.
 Journal of Experimental Medicine, Baltimore, December, 1917, xxvi, No. 6, 825.
 Journal of the American Medical Association, November 24, 1917, p. 1765.

theories regarding the formation of stone are being reviewed and clinically investigated. In reviewing this field, we find that Aschoff and Bacmeister have divided gall-stones into the following groups:

(1) Pure cholesterol stones.

(2) Stratified cholesterol stones with calcium.

(3) Colesterol, pigment-calcium stones.

(4) Composite stones, composed of cholesterol and a mantle of cholesterol and calcium.

(5) Bilirubin-calcium stones, usually found in the bile passages of the liver.

(6) The very rare calcium carbonate stones.

The French school, captained by Chauffard and his co-workers, have pointed out the importance of cholesterol as an etiological factor, while Rosenow has championed the bacterial side of the etiology. The interesting point in this communication is the analysis of stones removed from 14 cases of cholelithiasis for the cholesterol content and the amount of calcium. One important point is evident, namely, that where a previous history of infection was evident, the stones were chemically composed of calcium salts while in those without a previous history of infection, the stones were cholesterol stones. This finding opens the way for further study. For instance, Rovsing's study of 320 cases showed that the gall-bladder was entirely sterile in 54 per cent.

We are inclined to doubt this finding as well as the statement of the author of this article that cholecystitis always follows stone, never precedes it.

Urobilin and Urobilinogen in the Duodenal Contents. Sanford, Giffin, Szlapka¹⁰⁸ have contributed an interesting investigation on the study of the amount of urobilin and urobilinogen in various conditions. It will be recalled that many workers have considered that the amount of bile was an index of blood destruction. More definitely, however, was it shown that urobilin and urobilinogen were evidences of blood destruction, and these substances may result as well from impaired organ function as from blood destruction. The authors point out the simplicity and preciseness of this method as compared with more complicated stool examinations.

From their studies in a group of 22 miscellaneous cases, low values were found in patients with anemia from hemorrhage, carcinoma, tuberculous peritonitis, syphilis, portal cirrhosis, chronic infectious arthritis, and gall-stones. They are low in 3 out of 4 patients with myelogenous leukemia.

In hemolytic jaundice, the amounts were consistently high, even though there was only a moderate grade of anemia. The values fell appreciably after splenectomy, but not as greatly as with pernicious anemia. In pernicious anemia the amounts of urobilin and urobilinogen were above normal in 84 per cent. of the cases. The amount of urobilinogen was constantly increased when the anemia was severe; older patients gave lower values than the younger ones. Following splenec-

tomy, there was a definite increase in the output of urobilin and urobilingen. The amounts of urobilin and urobilingen did not run parallel to bile.

THE METHOD OF OBTAINING THE DUODENAL CONTENTS. The tube and metal capsule employed are similar to those of the Einhorn duodenal tube, but experience has led to the use of a somewhat stiffer tube and a capsule which, though similar in shape, is slightly larger and heavier. This capsule was recommended by Schneider. However, an ordinary Einhorn or a Relifuss bucket may be used. For convenience in observing the contents of the tube, a piece of glass tubing is inserted at its end.

In the preparation for the examination, the patient is instructed to partake of no food for at least twelve hours, except perhaps a little tea or coffee without cream, and to take frequent sips of warm water up to the time of the examination. The nature and purpose of the test are also explained, as the patient's confidence and cooperation aid in the

passage of the tube.

The passage of the duodenal tube is a simple procedure. The metal capsule is placed on the back of the tongue and the patient is directed to swallow hard several times in rapid succession. There is usually some difficulty as the capsule reaches the level of the cricoid, but this is overcome by deep breathing. After the capsule has passed this irritable zone, peristalsis carries it along without further discomfort to the patient and largely beyond his control. He merely swallows from time to time, taking a few sips of warm water and the capsule finally reaches the stomach and comes to rest at about 60 cm. from the incisor teeth.

The patient is now made to lie on his right side, with the hips elevated 8 to 10 inches. The pyloric end of the stomach thus becomes more dependent, and gravity, aided by gastric peristalsis, causes the capsule to pass through into position in the duodenum some 70 cm. from the incisors.

In our experience, this is accomplished in from fifteen minutes to an hour, usually in about forty-five minutes. At no time is it necessary to push the tube on its way. Pushing only tends to coil it up in the stomach

and may even frustrate its passage into the duodenum.

With the patient on his side, the end of the tube is allowed to hang well over the edge of the table. Gastric contents siphon out first, the siphon being started by the injection of a few cubic centimeters of warm water. As the capsule moves through the pylorus into the duodenum, the fluid recovered becomes vellowish, and, finally, clear bile is obtained. It may vary in color from light yellow to chocolate brown. Pure duodenal fluid is faintly alkaline, clear, of quite uniform color, and viscid; the foam is golden. The liquid must be alkaline. Its mere appearance is not a safe guide as to its identity, although, with experience, one may come to recognize it readily. The character of the fluid collected must be observed closely, as from time to time the pylorus permits the passage of gastric contents into the duodenum. This impure liquid may be detected by its change in color and its dull, cloudy, opalescent appearance, diminished viscidity, more rapid flow, and change in reaction to litmus or Congo red. It should, of course, be discarded.

Should the flow of bile become interrupted for an unusual length of time, the injection of a little warm water into the tube or the taking of deep breaths by the patient, will help to reestablish it. The application of suction is neither necessary nor advisable.

It is our custom to collect the duodenal contents in a small, ambercolored bottle, as air and light cause the rapid transformation of the urobilingen into urobilin; 20 c.c. of liquid are necessary, for the test

should be made immediately.

LABORATORY TECHNIC. The duodenal contents are poured into a graduated cylinder as soon as it is brought to the laboratory, and the gross appearance noted. Normally, it is a light, straw-colored, viscid fluid, and this is reported as normal yellow (N). The color may vary to dark yellow-brown, and chocolate. The dark-colored fluids always yield much bilirubin, but the color of the duodenal contents does not always indicate the amount of urobilingen or urobilin present, as these derivatives of bilirubin are sometimes demonstrated in considerable amount in normal yellow fluids. Occasionally, however, in cases other than pernicious anemia or hemolytic icterus, a colorless, watery secretion, with no biliary pigments or derivatives, is collected.

When 20 c.c., or more, of clear duodenal contents is collected, it is divided into two 10 c.c. portions in 25 c.c. graduates. To one 10 c.c. portion is added an equal amount, 10 c.c., of a saturated alcoholic solution of zinc acetate (Schlesinger's solution). The mouth of the graduate is closed by the thumb and the contents thoroughly mixed by vigorous shaking for about one minute. The mixture is then filtered through a single layer of coarse filter paper, the filtrate being collected in another clean, dry graduate. When exactly 10 c.c. of filtrate is obtained, it is used for testing the urobilin and urobilingen. To this mixture, which consists of 5 c.c. of duodenal contents and 5 c.c. of Schlesinger's solution, is added exactly 1 c.c. of Ehrlich's aldehyde reagent, measured with 1 c.c. pipette, the color of the fluid is usually significant when viewed by transmitted and reflected light. If urobilingen is present in considerable amount, especially if it predominates, the fluid, on the addition of Ehrlich's reagent, becomes a cherry-red, varying in intensity with the amount of chromogen present. When there is a preponderance of urobilin, the color by transmitted light is yellow or brown, and by reflected light a green fluorescence characteristic of mixtures of urobilin with zinc salts is noted. The graduate is now set in the dark for fifteen minutes before it is examined spectroscopically. This length of time seems necessary to sufficiently reveal the absorption bands of the spectrum, while if the mixture stands for longer intervals of time some of the mother substance, urobilinogen, may become converted into urobilin.

While waiting before making the spectroscopic examination, the second 10 c.c. portion is tested for bilirubin. To the duodenal contents in the second 25 e.c. graduate is added exactly 10 c.c. of 10 per cent. aqueous solution of calcium chloride made slightly alkaline to litmus with normal sodium hydrate solution. The mixture is thoroughly shaken, and then poured into two 15 c.c. centrifuge tubes, 10 c.c. in each. It is then rapidly centrifugalized for a few minutes to collect the precipitate into a compact mass. The supernatant fluid is decanted and the residue washed out of the tubes, with a few cubic centimeters of acid alcohol into a porcelain evaporating dish. In all, about 20 c.c. of acid alcohol is used to dissolve the precipitate. The alcohol mixture is carefully heated on a copper warming stage and allowed to boil vigorously. The color, which may be a brick red, soon changes to green if there is much bilirubin present. The mixture is concentrated so that its volume just reaches the "U" in an Esbach albuminometer. Alcohol is added to the mark "R." The color of the fluid by transmitted light is then compared with three standard tubes marked according to the shade of emerald green as viewed by transmitted light. The standard tubes are prepared arbitrarily from specimens containing appreciable amounts, moderately large amounts, and excessive amounts of bilirubin. These alcoholic solutions may be kept indefinitely without change of color, though it may be advisable to place the tube in the dark when it is not in use.

The first mixture is now examined spectroscopically for urobilinogen and urobilin. The spectroscope we use is of the simple students' type having a colorimeter, with a slit adjustable by a thumb screw, a scale tube, and a draw-type of telescope. We use a 250-watt Tungsten electric lamp mounted on a stand with a green shade reflector. This is adjusted so that when the colorimeter of the spectroscope is placed about 8 inches from the globe, a brilliant spectrum is produced. The glare of the light is kept from the eyes by the shade of the lamp, and by a shield of black cardboard perforated so that it may be slipped on the colorimeter tube. For observing the absorption bands, Schneider uses

a 50 c.c. graduate cylinder.

Our own observations were made in this manner up to October 1, 1916, since that time we have used a spectrum cell with parallel sides, and of such dimensions that the distance traversed by the rays of light in passing through the fluid is exactly 1 cm. Schneider opened the slit of the colorimeter eight half turns, or four full turns, of the adjusting screw when using a cylinder for examining the solution. We have found this slit too wide with the standard spectrum cell, and have, accordingly, used a slit of just half the width. Thus, to adjust the colorimeter we completely close the slit and then open it by four half turns, or two complete turns, of the adjusting screw. This gives apparently about the same degree of absorption with the standard cell as is obtained with the cylinder when the slit is twice as wide, so that in this way all readings are made to conform to Schneider's standard.

The presence of urobilin is marked by a broad band in the blue end of the spectrum. The violet rays are completely absorbed, and, if there is much urobilin present, the entire blue portion, and nearly all of the green, may be obliterated. Urobilinogen absorbs a narrow portion of the spectrum in the yellow at the edge of the green, and, if present in large amounts, the band may be broad enough to obliterate the entire yellow portion of the spectrum. It is located by its proximity to the "D" Frauenhofer line, while urobilin extends from between the "B" and

"—" lines to the violet end of the visible spectrum.

The method used by Schneider to estimate the quantity of the absorb-

ing substances is that suggested by Wilbur and Addis. The solution is diluted carefully with alcohol until the absorption-bands disappear. The urobilingen and urobilin differ in their intensity; consequently, the disappearance of the absorption bands will occur with different dilutions, although at times the same dilution causes the clearing of the spectrum in both regions. The end-point is determined when the absorption bands disappear, but can be made out faintly when the slit is narrowed to just half of its former opening, that is, when the cylinder method is used the adjusting screw is turned four half turns. With the standard spectrum cell, the end-point is determined by causing the reappearance of absorption bands with two half turns.

The amount of urobilin and urobilingen is estimated according to the Wilbur and Addis method for 1000 c.c. by multiplying the number of dilutions by 200. This factor is used since 5 c.c. of duodenal contents is represented in 10 c.c. of filtrate obtained from the mixture with the Schlesinger solution. The number of units of urobilingen and urobilin are added together and the total number of units reported, e. g., urobilinogen (three dilutions) 3 x 200 = 600 units; urobilin (four dilutions)

4 x 800 units; total 1400 units.

Hemolytic Jaundice. Giffin¹⁰⁹ describes the study of 17 cases of this disease which occurred in the Mayo clinic. Of the 17, 3 were jaundiced from infancy, while the author classified 10 as being congenital in type. Three of the cases were definitely familial, while 6 gave a suggestive history. In all cases the jaundice was definitely acholuric and seems never to have disappeared. In 12 of the 17 cases, the spleen was definitely palpatable. In the 12 operative cases it varied from 300 to 1780 grams, with an average of 1070 grams. That is to say, five to six times the size of the normal spleen. Two of the 5 non-operative cases, and 8 of the 12 operative cases, showed enlargement of the liver. Only 1 patient showed a small amount of free fluid in the abdomen. Sixteen out of the 17 cases gave a history of attacks varying from mild abdominal distress, nausea, fever, vomiting, and headache, to actual pain when gallstones were present. Very important is the point of recurrence of deepening jaundice, with the crises. In only 2 cases was the anemia severe, the average hemoglobin was 59 per cent. Color index was, as a rule, high, the leukocytes counts averaged 10,950, with little change in the differential count.

In the majority of cases, after splenectomy there was an increase in the relative percentage of small lymphocytes, and a decrease in polymorphonuclears; the reverse has been noticed in pernicious anemia after splenectomy, that is, the blood has shown an increase of polymorphonuclears. With the fragility test, the hemolysis was complete as from 0.42 to 0.48 per cent. sodium chloride. On the controls were usually 0.032 to 0.326; in 5 cases in which the urine was examined for urobilin and urobilingen, they were found to be present in each instance, while bile was not found in any case. Eleven of the 13 cases examined gave a negative Wassermann. The blood-pressure was, in general, low, and there was very little loss in weight. Three of the patients from whom the spleen had been removed had been previously operated on for gall-bladder disease, while 7 of the 12 cases showed gall-

stones, for which a later operation was done.

Regarding the examination of the hemoglobin pigment in the duodenal content (Schneider tests), the values for urobilin and urobilinogen in the duodenal contents is an index of blood disturbance, at a given time. For instance, twelve tests done on 6 of these patients showed an average of 2050 units for urobilin, and 1100 units for urobilinogen, these values

fell after splenectomy.

The patients usually show marked improvement after removal of the spleen, in fact, there is noticeable improvement in the jaundice, usually within twenty-four hours. There was one operative death. Giffin, in discussing this disease, says: "Hemolytic jaundice may be regarded as the diagnostic keystone of the diseases associated with splenomegaly and anemia. In clinical significance, it occupies the center of a group of diseases with cirrhosis of the liver, syphilis of the liver with splenomegaly, and obstructive forms of chronic jaundice on the one hand; and pernicious anemia, splenic anemia, leukemia and splenic Hodgkin's disease on the other. An appreciation of the characteristics of hemolytic jaundice gives a new insight into the diagnosis of these interesting diseases.

The differentiation between chronic jaundice due to obstruction of larger ducts and hemolytic jaundice (which in part may be due to obstruction of smaller ducts) depends largely on a recognition of the type of jaundice present. The jaundice of uncomplicated hemolytic jaundice is an intensified "hemolytic" icterus, an exaggerated form of the icteroid tinge so constantly seen in pernicious anemia. It is an acholuric jaundice; there is no bile in the urine; it is not associated with pruritis; it is of a chronic nature and may be comparatively deep or of mild grade; it is usually remittent in type and never entirely disappears. In obstructive jaundice there is cholic urine and frequently acholic stool; in hemolytic jaundice acholic urine and cholic stool.

The second more important distinction between obstructive jaundice and hemolytic jaundice lies in the difference in the resistance of the crythrocytes in the peripheral circulation to hypotonic salt solution. In obstructive jaundice, the resistance of the red cells is quite constantly increased, sometimes very markedly increased, while in hemolytic jaundice it is decreased; that is, the cells are more fragile. This has been found to be a congenital condition, and members of the family should be tested for fragile corpuscles in order to ascertain exact data concerning the congenital factor in a large percentage of the cases. An increase of fragility in other members of the family may prove to be

corroborative evidence to a diagnosis.

In Giffin's summary, he states:

1. Seventeen cases were reviewed of which 4 are probably of the acquired type. In 12 of them splenectomy was performed.

2. An increased fragility of the erythrocytes in the peripheral circulation was a constant finding in all 15 cases tested. This increased fragility

was found to persist at varying periods after splenectomy in 7 of 8 patients tested.

3. The values for urobilin and urobilingen in the duodenal contents were high in 6 patients in whom they were estimated. There was an

appreciable fall in these values following splenectomy.

4. In 7 (58 per cent.) of 12 splenectomized patients, gall-stones were present. The removal of gall-stones has not cured hemolytic jaundice. On the other hand, patients with hemolytic jaundice who were splenectomized have been cured of their jaundice and anemia though retain-

ing the gall-stones.

5. Of the 12 patients on whom splenectomy was performed, 10 are living, 9 are in splendid health, without jaundice or anemia. There was one operative death. One patient died four months after operation; another patient, with a severe form of the acquired type of the disease, who was in excellent health for eighteen months had a relapse after two years, and is again in fairly good health after two and one-half years following two transfusions. Four patients have been in excellent health for fourteen months, fifteen months, twenty-four months, and five and

one-half years respectively.

Hyperchlorhydria from Biliary Troubles. Robles¹¹⁰ believes that the recent statement of Pauchet, that of 10 persons having gastric disturbances about 9 of them are due to a reflex origin, is correct. He reports a series of cases in which the symptoms apparently were those of lesions of the pylorus, or cancer of the stomach, but which were really due to liver abscess, gall-stones, or general sluggishness of the liver. Unless bile is normally secreted and passed along the intestine, pancreatic juice is not stimulated, and therefore it does not accomplish the regulation of gastric acidity, so that an excessive acidity occurs. This is the author's hypothesis of hyperacidity and gall-bladder disturbances.

It is well known to every clinician that gall-bladder disturbances will frequently mask themselves beneath gastric symptoms, and while it is true that there is frequently an high acid condition in the stomach, in gall-bladder disease the incidence of high acidity is not greater than that seen in chronic appendicitis, in the latter disease the action of the pancreatic mechanism cannot be invoked. In studies on this subject it can be demonstrated that in many instances the regulating mechanism is not disturbed. However, clean digestion with persistent high acid figures should always suggest an extrinsic cause, and not the least among these is gall-bladder disease.

Spirochetal Jaundice (Icterohemorrhagic Spirochetosis). From different parts of the world, and especially from the armies in France, come reports of a form of infective jaundice. Dawson, Hume, and Bedson¹¹¹ have demonstrated that this disease found in France has the same clinical and pathological features as that described by the Japanese workers and is caused by the spirocheta icterohemorrhagica. Even in Peru,

¹¹⁰ Cronica Medica, Lima, September, 1917, p. 316. ¹¹¹ British Medical Journal, September 15, 1917, xi, 345.

Arce and Ribeyco¹¹² mention a case in which animals inoculated with the urine developed the disease, and in which the presence of the specific spirocheta of Inada and Ito was found. There is some evidence, however, to demonstrate that the disease may occur without jaundice. Favre and Mathieu, 113 for instance, record the instances of 7 men in their service in whom the spirocheta was found in the urine, in 2 cases up to three months. One individual had a form of arthritis which failed to react to salicylates, and another died of nephritis.

While the nature of this disease was thoroughly discussed in the contribution on these diseases in the last issue of Progressive Medicine. it is interesting to note the increasing frequency and importance of the disease and the points which have arisen in connection with it. For instance, Aragao¹¹⁴ discusses the similarity of yellow fever with infectious jaundice, and the frequent coexistence of the two diseases when the former was prevailing. The nervous system is depressed in both, and the heart weak: death in yellow fever commonly occurs between the sixth and tenth day, and in infectious jaundice between the eighth and sixteenth day, although in the latter disease the mortality is small. In vellow fever the germ is not found in the blood after the third day, so that any drugs must be given during, or before, this time for efficient action. He suggests that the cure which has proven effectual in epidemic jaundice might cure yellow fever, therefore he advises salvarsan or its substitutes in large doses during the first three days of vellow fever, never less than 50 to 60 cg. of salvarsan. In this way, by striking hard, he claims that the germs can be eliminated before the danger phase.

Pagniez and his associates¹¹⁵ found the spirochete in 45 out of 87 eases of jaundice in soldiers, and they lay stress on the reddish-saffron tint of the jaundice. The tint is a combination of yellow with a vasodilatation of the skin. Even if jaundice be lacking, the latter is pronounced. Furthermore, there are certain rather unstable pigments in the urine. If a few drops of acetic acid are added to a few cubic centimeters of urine, and it is heated as in the albumin test, the acidified portion of the urine turns a bright green—this phenomenon occurring only between the fifth and the eighth day. Blood platelets are below normal, and the clot fails to retract properly. During convalescence, pallor, persistent jaundice, and falling of the hair are striking features, alopecia being found in 21 out of 26 cases, resembling in every respect syphilitic alopecia.

These same authors discuss the laboratory technic connected with the disease.

Pagniez, and his co-workers, 116 in a study of 102 men with infectious spirochetal jaundice, found that the spirochetes were present in greatest number in the urine between the fifteenth and twentieth day. They remain a long time in the urine, some having been found as late as the forty-fourth day. Fermentation of the urine destroys them, but the

<sup>Cronica Medica, Lima, Peru, October, 1917, xxxiv, No. 65, 355.
Bull, de la Soc. Méd. des Hôpitaux, Paris, December 21, 1917, xli, No. 36, 1273.
Brazil Medico, Rio de Janero, December 1, 1917, xxxi, No. 48, 409.
Bull, des Soc. des Hôpitaux, Paris, November 30, 1917, p. 1181.</sup>

¹¹⁶ Bull, de la Société Médicale des Hôpitaux, Paris, January 11, 1918, xlii, 1,

addition of 5 per cent. of a 40 per cent. solution of formaldehyde will preserve them. Centrifugalization can be dispensed with by using the ligroin method. Three to five cubic centimeters of 95 per cent. alcohol are added to 40 to 50 c.c. of urine (with the formaldehyde added) in a large test-tube. When well mixed, ligroin is added to a height of 3 to 5 mm. Plug with a cork and agitate well for a minute and then stand upright for half an hour or more. With a pipette, remove some of the supernatant liquid (a few drops) on a slide. Mix with several drops of alcohol and spread on a clean slide. Dry in the incubator and treat as usual. Silver preceded by tannin for spirochetæ is the usual technic used.

Carpi¹¹⁷ reviews his experience with 300 cases of icterohemorrhagic spirochetosis. He calls attention particularly to the long incubation period (fifteen to twenty days, or longer). The glands in the groin and axilla were swollen but not tender, and the blood showed polynuclear leukocytosis which differentiated it from the leukopenia of typhoid. He

found a combination of arsenic and mercury very useful.

Regarding the distribution of the spirochetes, Inada, 118 Kaneko and Okudo, studied this problem from the necropsies of 43 patients who died in various stages of the disease. The spirochetes appear first in the liver and suprarenals, but remain for some time in the muscle, prostate, thymus, appendix, testicles, epididymis, etc. In the kidneys they are often found for a long time. Again, in the early stages they are usually

situated extracellularly in the interstices, later intracellularly.

In 34 out of 92 cases, or 37 per cent., examined by Ido, Hoki, Ito and Wani, 119 spirochetes similar to the spirocheta icterohemorrhagiæ were present in the kidneys and urine, as directly demonstrated by dark ground illumination or indirectly by inoculation. The organisms cannot be demonstrated in the blood and liver, but in the urine of rats harboring the disease, they can be found almost without exception. Urine even containing small quantities of the spirochetes readily infects guinea-pigs when injected intraperitoneally. In Japan, the rat is undoubtedly the carrier of the spirochete or its causative agent. Mus decumanus was found to be a carrier in 40.2 per cent. of 149 cases. Mus alexandrinus was found in 0.8 per cent. of 24 cases. From these studies, the authors conclude that the extermination of rats and field mice is a very important prophylactic measure against epidemic jaundice.

Inada, Ido, Hoki, Ito, and Wani discuss the intravenous serum therapy of the disease, and Kaneko and Okudo¹²¹ discuss the distribution of the spirochete after intravenous serum therapy. The latter authors state that the immune serum of Weil's disease is capable of destroying the spirochete found within the organs of man, with the exception of the kidneys, and that the action of the serum is spirochetolytic and spirocheticidal. The scattered spirochetes in the kidneys are resistant to the action of immune serum. The spirochetes, however, tend to disappear

120 Ibid., February, 1918, p. 283.

¹²¹ Ibid., p. 305.

¹¹⁷ Policlinico, Rome, July 29, No. 31, xxiv, 949.

¹¹⁸ Journal of Experimental Medicine, Baltimore, September, No. 3, xxiv, 325, ¹¹⁹ Ibid., September, 1917, No. 3, xxiv, 341.

almost completely from the organs even when no serum is administered, with, again, the kidneys as an exception.

Inada, 122 from the administration of intravenous injections of antiserum, confirm the efficacy of this method in 41 cases. They declare that five minutes after the intravenous injection of 0.5 of the antiserum per kg. of weight in the rabbit, the antibodies appeared complete in the blood. With subcutaneous injection, however, they appear only in incomplete form and not until after eight hours. This passive immunity lasts for three or four days. The intravenous scrotherapy seemed to act favorably on the hemorrhagic diathesis, the pulse, and the purulent complications.

Notari¹²³ reported 6 cases of chronic suprarenal insufficiency after epidemic jaundice. The pigmentation resembles that of Addison's disease, and the weakness was extreme. In one case there were two periods of acute suprarenal insufficiency. Apparently, after the liver and kidneys, the suprarenals suffer most from the infection. The spirochetes accumulate in these organs in enormous numbers.

Causes of Recurrence after Operation on the Biliary Passages. Eisendrath¹²⁴ gives an interesting summary of the causes of recurrence after operation on the gall-bladder and bile passages. As this subject concerns every internist, it is important that the cause of recurrence after these operations be recognized. These recurrences are divided into two classes, the true and the false. True recurrences are those in which there has been a reformation of stone. Under false recurrences, the author includes: (1) Overlooked calculi; (2) adhesions; (3) chronic pancreatitis; (4) persistence or recurrence of original infection; (5) strictures; (6) fistulæ (external and internal); (7) faulty technic, for instance, suturing the gall-bladder to the abdominal wall or insufficient removal of the cystic duct, permitting the formation of a dilated stump, with the possible true reformation of calculus in the same; (8) incorrect diagnosis, for example, tabes and spinal tumors; (9) coëxistance of two conditions, as, for example, renal calculus; (10) contraction of the ampulla of Vater, and (11) cancer of the head of pancreas.

This subject is becoming increasingly important as the number of gall-bladder operations has increased. In my opinion, everything hinges on the form of operation; however, intrahepatic calculi, adhesions, persistent stump with dilatation, and pancreatitis may all play a role, but persistent infection is probably the most common that we are called upon to treat.

Fecal Signs of Liver Disease. Campana¹²⁵ maintains that when there is an irritative lesion of the liver, the stools show cellular detritus, nuclei of liver cells, leukocytes, the bile pigments of these cells and glycogen. They pass out of the liver in the bile and may be detected in the move-

Bulletino dell Instituto Sierroterapico, Milan, November, 1917, p. 111, Abs. Journal of American Medical Association, 1918, vol. lxx, No. 14, p. 1043.

Rivista Critica di Clinica Medica, Florence, August 18, xviii, No. 33, p. 309 and

No. 33, 325.

¹²³ Journal of the American Medical Association, November 24, 1917, lxix, No. 21,

¹²⁵ Riforma medica, Naples, April 6, 1918, No. 13, p. 262. Abstract, Journal of the American Medical Association, lxx, 1918, p. 1802.

ments. The author insists that the patient be kept on a starchy and albuminous diet for several days, and the teeth kept clean, as well as the

Echinococcus Cyst of the Liver Perforating into the Pleura.—Allende and Rosso¹²⁶ discuss an operation for supposed pleurisy (purulent) on a married woman, aged forty-three years. The pleura was found to contain pus and daughter cysts, some empty and some intact. The cavity was properly drained, but the persistent temperature confirmed the suspicion of an echinococcus cyst in the upper part of the liver. This was drained from below the diaphragm through a second incision, suturing the lips of the cyst to the skin. Bile came away with the pus, but the condition rapidly improved. The diagnosis was that the cyst had perforated, first, into a bronchus, the symptoms and expectoration at that time having been ascribed to an acute bronchial infection. A few weeks later the cyst perforated into the pleural cavity, the bronchus apparently being insufficient.

Dedichen¹²⁷ tabulates the findings of various Tests of Liver Function. methods of functional liver testing. He claims, from studies on healthy and diseased individuals, that urobilinuria is only found when the liver is inefficient, and that it is a real sensitive test of liver function. Persistent urobilinuria with heart disease indicates hepatic insufficiency, and, when prolonged, may be taken as an index of early cirrhotic changes in the liver parenchyma. Alimentary glycosuria also indicates hepatic insufficiency, but it may occur in so many different conditions that its value is doubtful. Lactose is more instructive than the galactose test.

Of still more value are the tests with 20 gm. of glycocoll, or 50 gm. of gelatine. Amino-aciduria follows this when the liver is diseased, and not otherwise. It is, therefore, of great value in beginning cirrhosis and diffuse toxic infections of the liver. Damage of the parenchma produces it more certainly than damage of the connective tissue. A reduction in the output of urea and NH₃, accompanied by an increase in the elimination of amino-acid after the glycoccoll tests is a combination only encountered in cirrhosis of the liver.

Wild Rats as Carriers of the Spirochete of Infectious Jaundice. Jobling and Eggstein¹²⁸ made an extremely interesting report regarding the possibility of wild rats as the carriers of the spirochete of infectious jaundice. They remarked that in view of the fact that a large number of troops are stationed in the various Southern camps, it is essential to determine whether or not wild rats of the south harbor the organisms.

It will be recalled that Inada, Ido, and others, demonstrated that rats carried these spirochete icterohemorrhagiæ, and that the majority of persons affected were those whose occupation brought them into more or less close contact with places infested with these animals. It may be recalled that Noguchi, in this country, found that spirochetes were present in the wild rats in New York City. The authors of this article examined a large number caught in different places in Nashville, Ten-

nessee. The rats were alive when brought to the laboratory, but were killed with chloroform, and the kidneys aseptically removed. From the kidney, a saline emulsion was prepared, and injected intraperitoneally into guinea-pigs; both the kidneys from the rats and the guinea-pigs inoculated were examined and it was found that at least 10 per cent.

harbored these spirochete icterohemorrhagiæ.

I can do no better than to quote verbatim, the statement of the authors: "From the foregoing it will be seen that about 10 per cent. of the wild rats of this community harbor the parasite causing hemorrhagic icterus, and, as Noguchi has shown that the rats about New York City are also infected, it is probable that similar conditions apply in many sections of this country. The importance of these observations becomes more evident when we consider the trench training that is now being given to the American soldiers in the various camps. Here we have duplicated in many ways the conditions that make possible the large number of cases now being reported in France and Italy, and our demonstration that the rats of the South harbor the parasites of this disease makes it obvious that all possible means should be used in the camps to eradicate these pests. It has been shown that the virulence of this organism for guineapigs increases rapidly when transmitted through several series of these animals, and we must not forget that the same thing may occur when the organism becomes acclimated to human beings. This would seem to explain the high mortality of 38 per cent. noted in Japan, where the disease is more prevalent; while in Europe, where fewer cases have been observed, the mortality is much less.

PERITONEUM.

Ascites, a Study of Cases in China. The Canton Hospital in China¹²⁹ seems to be unusually favored with cases presenting ascites. In thirteen months, from March, 1914, to April, 1915, 3.95 per cent. of all admissions were those of ascites. In other words, of the 2250 admissions, 70 were suffering from this condition. It therefore seems that the diseases predisposing to the accumulation of free fluid in the abdomen must be unduly frequent in China. With an idea toward determining just what were the causes of this frequency, Cadbury studied 80 cases which are classed under eight headings:

Predominant lesion.	Cases.	Percentage.
Hepatic disease	. 22	27.5
Splenomegaly	. 13	16.25
Hepatic disease and splenomegaly	, ,)	6.25
Nephritis	. 21	26.25
Heart disease	. 10	12.55
Nephritis and heart disease	. 3	3.75
Tuberculous peritonitis	. 4	5.0
Abdominal tumors	. 2	2.5
	90	100.0

All these patients were Chinese.

¹²⁹ American Journal of the Medical Sciences, 1917, cliv, 425.

Hepatic and cardiac cases showed about equal numbers before and after the fortieth year, but there were four times as many nephritic cases before the fortieth year as after it. The series seems to indicate that ascites is rarely found in Chinese under nineteen years of age, unless it is accompanied or caused by tuberculous peritonitis. In the discussion of previous disease, the author states that there is no doubt that malaria is often the cause of many cases of splenomegaly. Dysentery was more frequently an initial symptom than a previous illness. One hundred per cent. of the hepatic cases used alcohol, and 83.3 per cent. of the splenomegaly cases were addicted to the habit, 91.6 per cent. of the renal 88.8 per cent. of the cardiac, and 66.6 per cent. of the cardiorenal cases belong to the same group. In explanation of this fact, the author states that rice wine is drunk generally, and may vary in strength from 4 per cent. up. But few of the cases were opium smokers.

Anemia was generally marked in the nephritic cases, more than half of which showed an hemoglobin below 70 per cent. The liver was enlarged in 7 cases; the spleen, in 19 cases. In one-half of the 40 cases examined for parasites and ova, paratites were found. Ankylostoma and clonorchis sinensis by their own pathological processes, may produce a profound anemia on the one hand, and extensive disease of the liver on the other.

Hookworms were found in 7 cases and clonorchis in 6.

In discussing the association of edema, which was found most frequently associated with renal disease, the author makes the following

statement:

"The frequent occurrence of edema in cases of nephritis among the Chinese is of special interest because of recent studies on the effect of sodium chloride on this disease. It is well known that the best method of treating the edema of Bright's disease is by giving a diet free from salt. Now salt among the Chinese is a luxury seldom indulged in by the lower classes. Rice, the main diet, is cooked and eaten without any salt. Meat is eaten in very minute portions by the laborer, and vegetables are likewise prepared without salt. We have, therefore, to deal with people who rarely eat salt and whose diet is mainly vegetarian, and yet afflicted with a severe form of nephritis frequently accompanied by local edema, ascites or general anasarca. In this connection, it is also of interest to note that the dairy products—milk, butter, cheese—do not form part of the dietary of the average Chinese."

There are 4 cases of tuberculous peritonitis, 2 in children, aged about

fourteen years, and 2 in adults.

The author's conclusions are as follows:

1. Ascites is a common condition in the medical wards of a hospital in Canton.

2. This condition is most frequently associated with cirrhosis of the liver or chronic nephritis, but splenomegaly, heart disease, tuberculous peritonitis, and abdominal tumors are also causative factors.

3. The male sex is more prone to this form of the disease than the female, and most cases occur between the twentieth and sixtieth years.

4. The majority of cases with ascites give an alcoholic history.

5. Although the Chinese are largely vegetarian in their dietary and

seldom eat salt, nephritis associated with edema is by no means uncommon.

Tuberculous Peritonitis. Cashman¹³⁰ gives an interesting exposition of tuberculous peritonitis. He says that the disease occurs much more frequently than is recognized owing (1) to the fact that it may occur in latent form without symptoms, and (2) because its manifestations are so varied that the diagnosis is obscure. The cases that are discovered are usually the advanced cases. Then again, the disease may be more or less localized, or spontaneously recover. The frequent association with general pulmonary tuberculosis, tuberculous adenitis, or tuberculosis of the intestines, is an aid to diagnosis and should suggest the possibility of the disease. The coëxistence of an effusion in another serous cavity,

such as the pleura, is of great diagnostic importance.

The disease occurs in three forms: The miliary, 68 per cent.; the chronic adhesive, 27 per cent.; the chronic ulcerative, 4 per cent. Symptomatically, we can have the acute, subacute, and chronic types. In the subacute and chronic types, the association of free fluid or palpable masses usually leads to the diagnosis. The acute type simulates acute appendicitis or intestinal strangulation. Palpable nodules or conglomerate tubercles on rectal examination are of importance. He found them in 4 of his cases. Moderate distention, abdominal tenderness without muscle spasm, abdominal discomfort, anorexia, alternating constipation and diarrhea, irritability of the bladder, weakness and loss of weight, and sometimes vomiting. Pigmentation of the skin occurs in a number of cases, and there is usually a rise of temperature which varies from a high continued to a slight evening elevation. Normal, or even subnormal, temperature may be present. A normal, or slightly increased leukocyte count with a relative increase of lymphocytes may be found. The value of the von Pirquet test is discussed, and it is pointed out that through overwhelming infection, there may be a negative reaction which later becomes positive as the condition of the patient improves and he reacts to the toxin. Tubercle bacilli are seldom found in the fluid removed by aspiration, and the examination reveals little of value, although a lymphocytosis rather indicates the tuberculous lesion. The fluid is usually straw-colored or bloody, but may be purulent in the ulcerative variety. Encysted fluid in the midline may be mistaken for ovarian cyst, and tumor due to rolled up omentum is frequently observed in the chronic forms. In 2 of his cases, the appendix was previously removed, but without relief of symptoms.

The prognosis is given as good. Oschner states that 50 per cent. are cured by medical treatment, and that 50 per cent. of the remainder are cured by surgical intervention. Active intestinal or pulmonary tuber-culosis influences the prognosis unfavorably. Persistent diarrhea usually signifies intestinal involvement. The chronic ulcerative variety is the least hopeful, collections of pus being the danger in this form.

The author states that medical treatment is always the plan indicated in treatment, and surgical intervention should be considered merely as

American Journal of Medical Sciences, 1917, cliv. 269.

an incident in the general plan of treatment. There is no doubt that, in properly selected cases, laparotomy frequently turns the tide. The idea is that the good results come from the exposure of the peritoneum to the air, with resulting hyperemia. The best results surgically are obtained on those cases with little, no no, fever. Operative procedure consists of incision, with evacuation of liquid, exposure of the peritoneum to the air with a minimum of trauma and intra-abdominal manipulation, and closure of the incision without drainage. Intra-abdominal medication is useless. Extensive breaking up of adhesions is liable to predispose to fecal fistula and persistent sinuses.

Rest and liberal diet is the medical treatment, which is combined with tuberculin when the temperature comes down. Sun exposures should be

given to different parts of the body.

This paper is based on the results of 21 cases; 16 of these were operated on, 3 of the 5 unoperated on died in the hospital. Of the 14 cases operated on at the St. Francis Hospital, 1 died ten weeks after operation. Letters were sent to 17, 11 were not heard from, 5 reported well.

The oldest was sixty-three and the youngest two years of age. There were 11 females and 10 males. Only 1 case was of the chronic ulcerative variety; 6 were well nourished, the rest undernourished and anemic. The highest leukocyte count was 16,000 in a chronic ulcerative type with pus formation. The lowest was 5150. Average white cell count was 9990. The highest hemoglobin was 90 per cent., and the lowest 52 per cent., with an average of 72 per cent. The average differential count for mononuclears was 28.3 per cent. in 11 cases. Of 9 cases, the von Pirquet was positive in 6, and negative in 3. The Wassermann test was negative in 3 cases in which it was performed. There was no case of primary peritoneal tuberculosis, for in all cases some other organ was involved. The glands in 8; adnexia and lungs in 1; lungs in 3; lungs and testicle in 1; lungs and pleura in 3; pleura in 3; meninges in 1. In the 6 cases in which the pleura was involved, 4 had effusion.

Pneumococcic Peritonitis. Evans Meredith¹³¹ states that pneumococcic peritonitis is a local manifestation of a pneumococcal septicemia. While it may clinically appear primary, it is practically always secondary to some other focus. Many pathways of infection have been suggested, such as the Fallopian tubes and vagina in the female, through the intestinal walls and from the diaphragm and pleura, but none of these seem satisfactory. The author states that there is apparently no reason to believe that the pneumococcus enters the body in any different manner when it causes peritonitis than when it causes pneumonia. In 136 cases of general peritonitis in children, including the appendicular and tuberculous type, 37 cases, or about 25 per ceut., were due to the pneumococcus.

The patient, usually a child, is taken ill, with pain, vomiting, high fever and rapid pulse. Pain is usually diffused over the entire abdomen; diarrhea usually appears but may be present early. There is some somnambulism, drowsiness, restlessness, or delirium, the important point

is the fact that there are few physical signs, but slight rigidity, some tenderness, with no maximum point, and often, after several days only, distention, with signs of peritoneal exudate. There is usually an increase in leukocytes of from 20,000 to 30,000. On opening the abdomen, a characteristic seropurulent to purulent exudate occurs. Smears and cultures invariably reveal the pneumococcus. In the diffuse or fulminating type, mortality is high, there being 85 to 90 per cent. of deaths. In the localized type, nearly all cases get well after early surgical interference.

DISEASES OF THE KIDNEYS.

By HENRY A. CHRISTIAN, M.D.

Blood Plasma and the Kidneys. The clinician is apt to think of the kidney as an excretory organ and to lay particular emphasis on the relation of it to the removal from the body of nitrogenous waste products. Though an important function, this may not be the primary, and most ancient, function of the kidney. While disturbances in the kidney lead to accumulation of nitrogenous wastes in the body, and these can be measured by analytical methods, the riddle of what causes the symptoms which we observe in the patient with diseased kidneys has not been answered as yet by our studies and measurements of these nitrogenous products. Perhaps, after all, the inorganic constituents of the plasma bear a larger part in renal symptomatology than we think, and more study of them would lead to fruitful results.

A. B. Macallum, in an interesting address entitled "The Ancient Factors in the Relations between the Blood-plasma and the Kidney," discusses the developmental history of the kidney and its primal function of maintaining a stable fluid medium in the body, a fluid medium whose inorganic character has been maintained unchanged through countless generations of mammalian life since it acquired its original composition

from the ocean of prehistoric time:

"Among all the organs, with their varied history as to structure and their variations in function, there is, however, one whose function in one particular respect has not changed from the time when it first began to evolve in the very far past. This organ is the kidney and the function which it performs, as it has performed it far back in the very beginning of the history of vertebrate life, is the regulation of the inorganic composition of the internal medium of the body, which we know as the blood plasma.

"This organ was among the very first to appear in the protovertebrate, or in the first invertebrate type which began to differentiate along the line of development which resulted in the appearance of the protovertebrate in the Cambrian, or, it may be, pre-Cambrian times. If we rely on the order in which the organs appear in the embryological history of the vertebrate, the renal organ is as ancient as the neural canal, and its origin would appear to antedate, by a long period, the closure of this canal and the disappearance of the coelomic cavity into which the primitive nephric tubules opened. If the latter are, as has been claimed, derived by differentiation from the coxal glands of a crustacean-like form, they are of more ancient origin than the neural canal itself.

¹ American Journal of the Medical Sciences, 1918, clvi, 1.

"Enough has been said here to emphasize the view that behind the functions of the renal organ is a history which links up the human body with the far past, with an age of the earth when its oceans contained only what would now be regarded as brackish water, and the earliest type of vertebrate life was just beginning to appear as a marine form. From the facts advanced, it will be gathered also that the blood plasma, so far as its inorganic salts are concerned, is but a reproduction of the remotely ancient ocean, and that it is an heirloom from the life in

'that immortal sea Which brought us thither,'

not indeed in the Wordsworthian sense, but in the literal one, for the sea is the original home of all life on the globe, and gave our blood, and, accordingly, the tissues of our bodies, a character that long ages have not effaced and will not efface.

"The sea is the original home of all life on our globe, and it was in the sea that the differentiation between animal and vegetable life, as well as the evolution of the great divisions of the animal kingdom, were effected. Indeed, the great events in the evolution of animal forms have been rendered possible by changes which have taken place in the composition of the ocean. Among the fundamental results of these changes was the development of a closed circulatory system of vertebrates, the fluid contained in which became henceforth independent of the composition of the contemporary ocean, and, as we have seen, of the ocean of subsequent periods even after many millions of years, as in the case of the Selachians (sharks), marine Teleosts (cod, herring) and the Cetacea (whales).

"The sea, ever since the first condensation of water on the original cooled rock crust of our globe, has been changing in composition by the leaching out of its bed the salts it contained and by receiving salts in the river discharge, also leached from the land areas of the globe. The quantity of salts annually discharged from the land areas is enormous. The concentration has, therefore, been slowly changing, and it must have been in the far past much less than it is now.

"The relative proportions of the various salts must have changed also. All the salts discharged in the ocean by the rivers have not been retained, for, were they retained, the potassium and the calcium salts would be very greatly more abundant than they are now. The magnesium salts also have been concentrating slowly, for the elimination of magnesium, as carbonate in the formation of dolomitic limestone, has been proceeding at a rate less than that of the constant addition through the river water. This would postulate that magnesium is not only absolutely, but also relatively, more abundant in the ocean of today than it was in that of the far past.

"The only constituents that are not extracted from the ocean are the sodium salts. These have always, therefore, been on the increase from a time in the early pre-Cambrian period, when they were perhaps but slightly in excess of those of potassium.

"The enormously long period during which the blood plasma has been simulating Paleoöceanic conditions in the concentration of its salts and in the ratios of the sodium, potassium, calcium and magnesium it contains, emphasizes the importance in one respect of the organ which has maintained through the long ages of vertebrate history this concentration, and these ratios, practically unchanged.

"This organ is the kidney. There is in invertebrates no structure with a similar function, or with a function even distantly approaching that of the vertebrate kidney. It is this organ that has made a fundamental difference between the vertebrate and the invertebrate, not only in the struggle for existence but also in the capacity to evolve higher forms of animal life. This function of the kidney is fundamental, and is more ancient than that of excreting the waste products of the tissues of the body.

"In the long ages the kidney has thus performed a function which, for constancy and unvarying regularity, is unrivalled in the world of life. This constancy, this unvarying regularity, contrasts strikingly with the variation in function which the other organs have undergone and indicates how basic the kidney is in the vertebrate system and why it takes

precedence in the body as a vertebrate organ par excellence.

In view of this important function of the kidney—namely, the stabilization of the inorganic constituents of the plasma—Macallum has studied the inorganic constituents of the plasma in a few patients with Bright's disease and eclampsia and found changes, an increase in particular in the potassium. Unfortunately, the determination of potassium, magnesium and calcium is difficult and tedious, and yet their determination in the plasma under diseased conditions might throw new light on the problem of the diseased kidney. That Macallum found an increase in potassium is of interest, for potassium is a toxic substance when retained in the body.

Normally it is excreted too rapidly to produce effects, but one of my former assistants, Smillie,² showed that, with a damaged kidney, potassium salts produced toxic effects, and in a rabbit with experimental acute renal lesions death resulted speedily from a relatively

small dose of potassium chloride.

War Nephritis. A very excellent review of war nephritis has been written by Ameuille,³ and this has been translated into English by Mosenthal.⁴ Ameuille points out that in civil life we encounter two types of acute nephritis: primary acute nephritis and secondary acute nephritis, meaning, by the latter, such as follows scarlet fever, diphtheria, syphilis, pregnancy, etc., while the former is independent of any known cause. Primary acute nephritis he regards as relatively uncommon in civil life, according to Herringham, 2.6 cases per 1000 medical admissions to St. Bartholomew's Hospital and still fewer in the Parisian hospitals.

Among the soldiers the nephritis is similar to the primary acute nephritis of civil life, though, according to Ameuille's view, it is probably not

⁴ Jour. Urol., 1918, ii, 51.

² Arch. Int. Med., 1915, xvi, 330.

³ Revue de Pathologique de Guerre, No. 5.

identical. Then acute nephritis is far more common in war than in civil life. War nephritis he subdivides into acute nephritis, with edema, and pure azotemic acute nephritis. Approximately 90 per cent. of the cases

studied by Ameuille belonged to the first type.

In the war nephritis with edema, a number of patients give a history of antecedent sore-throat. Initial bronchitis seems to have been more common in the English than in the French army. The Germans consider exposure to cold as an important cause, but Ameuille does not think this is the case, but, rather, the patient who is feverish has chilly sensations and so has the impression of having been exposed to cold. Slight fever at the onset is the rule. Edema of the face is by far the most common symptom and sign, and, if the edema becomes marked, the serous cavities contain fluid. If the presence of edema is judged by the patient's weight, it persists on the average for fifteen days. Decreased urine output is found in the acute stages, but the amount is usually 500 c.c. or more in the twenty-four hours. According to Ameuille, in the early stages theobromin produces no diuresis, while later on it does. Judging from my own experiences with diuretics, I would think the diuresis might be, in part, in spite of the theobromin rather than due to it, and that in the early stages of the disease it was harmful.

Albumin is very abundant in the urine, so that often the urine boils solid, and it persists longer than the other changes. Casts are absent in 60 per cent. of Ameuille's cases, while Rose Bradford, in English soldiers, found casts in 794 out of 1301 cases. Granular casts predominate. Ameuille lays stress on a large number of polynuclear leukocytes as the most constant urinary finding. Microscopic blood is common, macroscopic rare (6 per cent. of Ameuille's cases). In the French troops, hypertension with the acute nephritis is rare. When hypertension occurs in some patients it is found in the early stages, while in others it develops only at a later period in the disease. Urea nitrogen in the blood is increased in the more acute stages and returns to normal by the end of the first week. It seems to me that this change might be due, in large part, to the high protein intake of the healthy soldier, which gives an accumulation of blood urea at the onset, and this is maintained for a time by poor elimination but rapidly drops to normal on the low protein diet of the days of treatment. This would seem true of those cases in which the increase is moderate and of short duration. In other patients with higher figures the urea is a better indication of damaged renal exerction. Albuminuric retinitis and retinal hemorrhages have not been observed in these cases.

The less frequent type of war nephritis—namely, the acute pure azotemic nephritis—presents rather more that is novel and of interest to the student of nephritic conditions. This type appears to have been recognized very little except by the French. Its symptoms are extremely deceptive and lead to diagnoses very foreign to that of nephritis. They have been classified as war nephritis on account of albuminuria, hematuria, increase of blood urea and their frequency at the Front. They develop most frequently under the guise of a febrile disease. The temperature rises more rapidly and fluctuates more than in typhoid fever.

The pulse is rapid and frequently small. There is general malaise, coated tongue, frequent attacks of vomiting and persistent severe headache. In the early days the urine is decreased to 600 to 700 c.c. per twenty-four hours. It contains few, or no, casts but a large number of polymorphonuclear neutrophiles and red blood cells. It always contains some albumin and at times a very large amount. The determination of the blood urea gives the most certain diagnosis. The cases with central nervous system symptoms are the most puzzling and misleading. Headache, epileptiform seizures and delirium occur, and sometimes lead to the diagnosis of meningitis. There may be stiffness of the neck and a positive Kernig sign, but the spinal fluid is normal. On account of the acute delirium in some, they may be mistaken for psychopathic cases. In this group the author includes cases of acute nephritis with jaundice. It seems, however, to me doubtful as to whether they should be included. for these appear to be cases of epidemic jaundice with renal symptoms and are caused by the spirochete of this disease. In this etiological sense they are quite different from the forms of war nephritis.

The prognosis in cases of war nephritis with edema is good for the immediate future. In the azotemic group without edema the immediate prognosis is not as good. The final prognosis in the sense of future

chronic lesions cannot be stated until more time has elapsed.

As to the pathological anatomy of war nephritis, relatively little material is available for study. Ameuille had six autopsies and thinks that the essential lesion is an interstitial lesion consisting of edema and exudate of polynuclear cells. In its interstitial character it is similar to the renal lesion sometimes seen in scarlet fever, though in the latter the infiltration is with lymphocytes and not with polynuclear cells.

The etiology of war nephritis is not clear. In the present war there seems to be close relationship between the incidence of the disease and prolonged service under conditions of trench warfare. It is of importance in this connection to note that in the Civil War in the United States there was an increased incidence of nephritis during the period when the fighting there took on the nature of trench warfare. Exposure to cold as a cause seems to be ruled out because in the present war an increased number of cases began in the British troops in the spring and in the French troops in the summer and a similar relationship in the American Civil War has been shown by Langdon Brown,⁵ where the peak of the wave of cases occurred in July. Ameuille dismisses as unproven the theory of intoxication, such as mineral from canned goods or from using chlorinated water, and attributes the chief role to infection, though the nature of the infection is not clear.

Langdon Brown,⁶ like Ameuille, dismisses cold, mineral matter or chlorinated water as etiological factors. Excessive protein intake he thinks not a cause. He, like Ameuille, inclines to the view that the condition has an infectious origin. He emphasizes the frequency with which shortness of breath occurred at the onset; this in the British troops

⁵ Proc. Royal Soc. Med., ix, Part 3. ⁶ Practitioner, 1917, xcviii, 111.

is in contrast to what Ameuille observed in the French. Osler7 has observed more cases with hypertension than did Ameuille. Andrews8 found in fatal cases the histological changes common to ordinary nephritis, and in this respect his experience differed from Ameuille. Wallis9 demonstrated a decreased diastatic ferment in the urine and found that the albumin was of the type usual to nephritides. Abercrombie¹⁰ noted the frequent occurrence of labial herpes as further suggestive of an infectious origin.

Tytler and Ryle, " unlike other observers, noted an increased incidence in the winter. Dyspnea they, too, found as a frequent early symptomand bronchitis was an almost constant complication. Fever, apart from bronchitis, was not common. The blood urea was moderately increased. Histological study of 20 eases was made by them. The lungs often showed purulent bronchitis and bronchopneumonia. The spleen showed areas of hemorrhage. In the kidneys, acute proliferative glomerular changes were the most constant findings, while tubular epithelium showed

moderate degenerative changes.

Keith and Thomson¹² have furnished us by far the most complete study of a group of cases of war nephritis, using modern methods for testing renal function. In a very thorough manner they studied 33 cases, especially selected from 300 that passed through their hands. Seven of their cases were fatal, and, of these, 6 came to autopsy. They subdivided the cases into a resolving and a non-resolving type whose

characteristics they summarize as follows:

"Resolving Type. These cases arrived at the base relatively soon after the onset of illness and were detained there a shorter time than the nonresolving type. During their stay very marked improvement occurred in their condition, a well-marked diuresis took place early in the disease and was accompanied by the disappearance of headache, dyspnea, etc. The blood-pressure fell rapidly. Retinal changes were infrequent, slight and transient. All showed a good phthalein excretion and the initial rise in blood-urea content quickly fell and remained low. Gross hematuria was rare and did not persist. Albumin and cylindruria decreased rapidly and the specific gravity of the urine tended to rise to its normal level. Ambard's coefficient on evacuation was frequently normal. Chloride elimination by the urine was good. Acidosis tended to be slight and the acid-base relationship was restored without alkali therapy.

"Non-resolving Type. Cases belonging to this group arrived at the base later in the disease and were detained there longer. Onset of divresis was delayed, edema tended to remain stationary or even to increase, marked secondary anemia developed and exacerbations of the disease were of common occurrence. Retinal changes were more frequent and permanent in character. Gross hematuria was a marked and persistent feature. Albumin and cylindruria did not clear up, and the specific gravity of the urine tended to remain low. Phthalein excretion was diminished; the initial blood-urea content was higher, its fall much

[·] Proc. Royal Soc. Med., ix, Part 3.

¹¹ Quart. Jour. of Med., 1918, xi, 112.

⁵ Ibid. 10 Ibid.

¹² Ibid, 229.

slower and its subsequent course uncertain. On evacuation, none of those examined showed a normal Ambard coefficient. Elimination of chlorides in the urine was often poor and concentration low. Acidosis was more marked, and persistent and alkali therapy was required to restore the acid-base balance."

Keith and Thomson emphasize dyspnea as a common and distressing symptom, usually with signs of bronchitis or basal congestion. Every case showed the presence of blood in the urine. Renewed hematuria they noted several times after the phthalein test. Edema was a constant feature, often developing with great suddenness. Spontaneous divires was often the first and surest sign of convalescence. Relapses were of frequent occurrence. The pathological change in the kidney of fatal

cases was chiefly a glomerular proliferative lesion.

A perusal of these several studies of war nephritis indicates to me not what the writers so often emphasize—namely, that they are dealing with a new and distinct disease entity but rather that they have studied a quite wide range of the clinical manifestations of acute nephritis of varying severity. Both the descriptions and the illustrations of pathological lesions of the British writers are at once recognized as types of proliferative glomerular lesions with which I am perfectly familiar in civil life. The interstitial lesion described by Ameuille I think I have seen too, but not often. Their studies of renal function show the same changes which occur in non-war nephritis, with the possible exception of Ameuille's pure azotemic nephritis which I have never encountered. The occurrence of polynuclear leukocytes in the urine, which is often emphasized as a characteristic of war nephritis, we often see in the acute nephritis of civil life, and the same is true of the early slight fever.

That under war conditions acute nephritis is much more common than in civil life there is no doubt. Also with more cases, particularly those of sudden onset and initial severity, a somewhat different general picture is given, for in civil life these cases with marked sudden edema are not very frequent, though they occur. In this connection it is of interest that in my own clinic at the Peter Bent Brigham Hospital there has been a distinct increase in 1916, 1917 and 1918 in cases of acute nephritis, as it has seemed to us, in relation to a prevalent infection of the upper respiratory tract. (Cases of acute nephritis at Peter Bent Brigham Hospital in 1914, 2; 1915, 8; 1916, 23; 1917, 19; 1918 to June 1, 17.) In these we have seen a nephritic picture in miniature very similar to that furnished by the trenches on a large scale, just as the winter of 1917–18 brought into our wards, in a small way, the same group of atypical pneumonias, bronchopneumonias and empyemas, which were so numerous and disturbing in our large army camps.

I believe that war nephritis is merely acute nephritis with many more cases of sudden onset and initial severity, brought on by the conditions of life of the soldier at the front in this war rather than a new disease entity. Probably mingled with these are cases of infectious disease, with strikingly prominent renal symptoms, such as Ameuille's cases of acute nephritis with jaundice, which would seem to be special forms of

epidemic jaundice due to the Spirochete icterohemorrhagiæ.

Tests of Renal Function. The current year has added but very little of importance in regard to renal function and methods for testing it. There has been no dearth of papers dealing with this phase of the nephritis problem, but in some sixty which were reviewed very little was found that was new. The papers deal, in the main, with the application of accepted methods to concrete cases or groups of cases with conclusions deduced from these studies essentially the same as in previous years. As perhaps might be expected, there is rather more of a note of caution against making too sweeping deductions from a group of tests applied at one time; the earlier enthusiasm, which lead some to stake all opinions in regard to nephritic cases on tests of renal function, is tempered by the noting of exceptions to the general trend of results. However, this is no change from the expressed views of those who have had the most experience in past years with this form of examination of renal cases.

I am inclined to think that as yet too few of these exceptions have found their way into literature and that many medical men have been led, in their too complete dependence on tests of renal function, to neglect extrarenal factors, and, if I may be permitted to say so, to use too little common-sense in forming judgments in regard to nephritis patients. As study has progressed it has become quite clear that the same rules do not hold for acute nephritis, chronic nephritis with edema, nephritis with high blood-pressure and cardiorenal cases. In regard both to diagnosis and prognosis, the results of tests of renal function require different interpretation in accordance with the type of case. For example, increased blood urea in acute nephritis has a different import from the same figure in the patient with hypertension and a chronic renal change; the patient with chronic nephritis with edema may show reasonably good phthalein excretion and have a very serious prognosis, while the cardiorenal case with the same poor phthalein excretion may have a renal structure little damaged, though at the time of the test renal circulation is poor and prognosis depends on the cardiac capabilities of the patient.

Notwithstanding these variations and exceptions encountered in tests of renal function, it is clear that these methods have been of very great usefulness in the study of patients with nephritis and they have helped much in diagnosis, prognosis and treatment. A large group of nephritic cases by nature have a long duration; the condition is a chronic one; this being true, observations of numerous patients over long periods, years not months, are required before we can expect to have any very complete knowledge of the significance of variations from the normal in renal function. It is just this sort of study of cases that remains lacking. On it depends our ultimate conclusions as to prognosis and treatment in patients with chronic nephritis and for that matter, too, as to the subsequent course of developments in the patient who has had an acute Repetition of tests on the same case over years and under varying conditions, as far as extrarenal as well as intrarenal factors are concerned, is needed for any adequate understanding of the nephritic. With this added to our present knowledge of renal function in relation to shorter periods of observation, we should be in a position to form

very definite ideas as to the value and the limitations of tests of renal function. It seems probable that, with the final verdict, we will continue to regard this type of study of the kidney of very great practical usefulness.

The complexity of present methods of studying nephritic patients is illustrated by a summary by Moses¹³ of methods that may be used:

1. In the examination of the urine.

(a) The specific gravity.

(b) The reaction.

- (c) Albumin and casts (cells should be added).
- (d) Salt and urea excretion when given by mouth.

(e) The lactose test of Voit.

(f) The potassium iodide test of Duckworth.

- (g) The urine with test-meals of Hedinger and Schlayer, Mosenthal, Frothingham and Smillie and Christian.
- (h) The excretion of phenolsulphonephthalein. (i) Sellard's alkali tolerance test for acidosis.
- (i) Fischer's alcoholic solution of methyl red test for acidosis.

2. In the examination of the alveolar air.

(a) The Fridericia method of estimating the carbon dioxide content.

(b) Marriott's method.

(c) The observations of Peabody on the carbon dioxide tension of alveolar air in nephritis.

3. In the examination of the blood.

(a) The blood-pressure and pulse-pressure.

- (b) Van Slyke's method of determining the alkalinity of the blood serum.
- (e) The hydrogen-ion content of the blood.

(d) The creatinin of the blood.

(e) The urea.

(f) The uric acid.

(g) The non-protein nitrogen content.

(h) Ambard's coefficient with McLean's modification.

To the methods cited might be added, as valuable in cardiorenal cases, a trial of the diuretic action of a drug such as the ophyllin (Christian¹⁴).

While these numerous methods have been used, all by no means needed in a practical understanding of a nephritic case, some duplicate others and some have been found to yield very little usable information. The study of the excretion of added salt and urea gives essentially the same information as is yielded in a shorter time by the study of the urine in two-hour portions after some such test-meal as that proposed by Hedinger and Schlayer. Lactose and potassium iodide are regarded generally now as not measuring what they were supposed to measure namely, tubular and glomerular selective activity (Geraghty, 15 as well as several other workers). Acidosis is present in severer nephritis but its

Medical Record, 1917, xci, 273.
 Jour. Urol., 1917, i, 319.

¹⁵ Southern Med. Jour., 1917, x, 194.

determination by any of the methods of studying the blood, urine or alveolar air is of little practical help. The determination of blood-urea, by reason of the simpler method, is sufficient in most cases to represent the activity of nitrogenous elimination. If found to be low, a determination of uric acid may be made as an index of less renal disturbance. If the urea value is high, a determination of creatinin may be made, for its marked retention is particularly of evil prognostic omen. If these estimations are made there seems no reason to quantitate the total nonprotein nitrogen of the blood, and some observations of Mosenthal and Hiller¹⁶ on 165 patients indicate that of the two a blood-urea determination gives more information that one of the total non-protein nitrogen, because in lesser degrees of disturbance they find an increase in the proportion of the nitrogen in the form of urea before the total nonprotein nitrogen is above a normal value.

URIC ACID, UREA AND CREATININ. During the past year more data has been accumulated in regard to the relative excretion of uric acid, urea and creatinin. The observations of Myers, Fine and Lough, 17 Gradwohl, 18 Watanabe 19 and others indicate that uric acid is excreted with more difficulty and creatinin with less, while urea is intermediate, when the kidney is damaged. Consequently an accumulation in the blood beyond the normal of uric acid becomes an early sign of decreased renal function, while, on the other hand, an accumulation of creatinin beyond normal is of the most serious prognostic import. These observations of abnormal amounts of uric acid in the blood increases the doubt as to the significance of uric acid increases in gout, doubt already expressed by Pratt and McClure²⁰ and by McClure²¹ in their studies

of gout.

During the year there has been some discussion as to the value of determinations of Ambard's coefficient or the McLean index for expressing a relation between the blood-urea and its rate of excretion in the urine in the form of a numerical factor that measures the efficiency of the kidney as an excretory organ for urea. Smith²² concludes that the index of urea excretion gives much more information as to the degree of renal involvement than does the blood-urea determination alone. On the other hand, Watanabe²³ arrives at just the opposite conclusion that the Ambard or McLean formulæ give little more information of diagnostic or prognostic value than the blood-urea alone, confirming the views expressed earlier by Addis and himself. Patrick, Vaughan, Bothman, Skinner and Kerr,24 Lewis,25 Nakagawa26 and others believe these coefficients give reliable information.

Addis²⁷ has studied the urea content of the urine and of the blood after the administration of large quantities of urea as an index of the

¹⁶ Jour. Urol., 1917, i, 75. ¹⁷ Arch. Int. Med., 1916, xvii, 570.

¹⁸ Urolog. and Cutan. Rev., 1917, xxi, v...

¹⁹ Am. Jour. Med. Sc., 1917, cliv, 76.

²⁰ Arch. Int. Med., 1917, xx, 481.

²¹ Jour. of the Amer. Med. Assn., 1917, lxviii, 278.

²² American Journal of the Medical Sciences, 1917, cliv, 76.

²³ American Journal of the Medical Sciences, 1917, cliv, 76.

²⁴ Arch. Int. Med., 1917, xix, 1.

²⁵ Arch. Int. Med., 1917, xix, 1.

quantity of actively functioning kidney tissue and draws the following conclusions:

"1. The ratio between the urea content of the urine and of the blood expresses the number of times by which the urea excreted in the urine during a certain period of time exceeds the amount of urea present in 100 c.c. of the blood supplied to the kidney during this time. It is the relation between the amount of work accomplished by the kidney and the most important measure of the amount of work the kidney is called on to perform.

"2. Ratios measured over periods of twenty-four hours are constant in normal individuals who have the same urea concentration. The normal kidney is therefore not characterized by any intrinsic tendency toward variability of function. Variations in the kidney function arise from differences either in the environment or in the anatomical structure

of the kidney.

"3. Ratios measured over short periods of time vary widely, even though the blood concentration be the same. This variability must be due to short-lived alterations in environment which counterbalance one another over long, but not over short, time intervals, for it can be shown that such anatomical differences as may exist between the kidneys of young healthy adults do not play any appreciable part in its production.

"4. Differences in the concentration of urea in the urine are not the

cause of this variability in the ratio over short periods of time.

"5. Evidence is given against the supposition that this variability arises from such alterations in the amounts of urea or of oxygen brought to the kidney as would be produced by differences in the rate of flow of blood through the kidney. Reduction of kidney blood supply below a certain minimum has a marked effect on the ratio, but it does not follow that alterations above that critical amount would have much, if any, effect.

"6. Since it is possible to increase the ratio by the subcutaneous administration of adrenalin and to decrease it by pituitrin, the hypothesis is advanced that part of the variability of the ratio for one hour periods at the same blood-urea concentration may be due to alterations

in the adrenalin-pituitrin balance in the blood.

"7. It is shown that the magnitude of the ratio increases with increase in the blood-urea concentration. In other words the kidney responds to a call for more work by an increase in output which is greater than the increase in demand. It is further shown that the relative variability of the ratio at different levels of blood-urea concentration decreases the higher that level rises. In other words the greater the demand for work the more constant does the rate of work of the kidney become. Both of these phenomena may be brought into relation with the hypothesis of a regulation of kidney activity by means of the balance between adrenalin and pituitrin in the blood.

"\$. There is evidence that a great relationship exists between the magnitude of the ratio and the size of the kidneys. This has been shown by comparing the average ratios obtained from species possessing kid-

neys which differ widely in size. The removal of one kidney leads to a depression of the ratio. In kidneys whose effective size has been reduced by necrosis or degeneration of varying extent there is a relation between the degree of depression in the ratio and the amount of tissue which has been rendered functionless.

"9. This direct relation between the magnitude of the ratio and the amount of actively functioning kidney tissue is only demonstrable under conditions in which the kidney is called on for the maximal activity of all its secreting elements and is subject to the least degree of variation in rate of work. The ratio can be taken as an approximate indication of the size of the kidney only when it is determined during the strain

induced by the administration of a large quantity of urea.'

Obviously the relation between the blood urea and that in the urine depends on renal function, and I believe that the formulæ, if they express this relationship, should be of value as measures of renal efficiency. Whether the laws governing urea secretion are definite enough to be expressed in formulæ or whether the indices indicate renal function any better than the amount of urea nitrogen in the blood are points on which there is no agreement. When the blood-urea is considerably increased there is a corresponding change in the Ambard coefficient or the McLean index, and in such cases the phthalein excretion corresponds closely, and we feel pretty sure that renal function is poor. When blood-urea and phthalein excretion are about normal there may be marked variations in the coefficient or index which do not seem always to correspond closely with the apparent renal function. It is in regard to such cases that most doubt has been expressed as to the value of the formulæ, and yet it is in this group that the formulæ would be most helpful if their results prove dependable. At the Peter Bent Brigham Hospital, as we have determined the McLean index in more and more cases, we have tended gradually to put less and less dependence on it and at present do not regard it as a very trustworthy measure of renal function in these milder cases, while in the more severe cases it adds very little information to that given by the blood nitrogen and phthalein determinations.

Renal Test Meals. Further use of test meals with a study of the urine collected at intervals of two hours has emphasized the value of this form of test as giving much information in regard to renal function and at the same time requiring simple methods easily carried out. Various types of diet have been described, but they are all essentially the same in principle and result. As with all other tests, caution is needed in regard to interpretation, particularly of a single test, as extrarenal factors influence results and must be allowed for. Lyle and Sharlet²⁸ have called attention to this. They point out that the effect of the state of water reserve of the tissues (this is a factor which I believe is but very poorly understood) and chilling of the body surface are factors that may influence significantly the results of a test-meal day. Judgment should be reserved, according to them, on the basis of a single test meal unless

the reaction gives evidence of marked renal insufficiency in individuals who are out of bed and exposed to the diverse influences of temperature, humidity and rate of metabolism, and in cases in which no strict control

of the dietary of the test meal is attempted.

Phenolsulphonephthalein. The excretion of phthalein remains a much favored test of renal function. The ease of its use, its lack of harmful qualities and the information yielded are constantly emphasized in its favor. In surgical conditions some prefer other dye methods of testing renal function, but the objectors are relatively few. Thomas and Birdsale²⁹ prefer indigo-carmine. Very little that is new has been brought out during the year in regard to this test. Peterson³⁰ has given a method for the simultaneous use of indigo-carmine and phenolsulphonephthalein in surgical diseases of the kidney which is simple and should be useful, as these two dyes are the ones most used and about which differences of opinion as to relative value has arisen. Peterson's method is as follows:

"1. The cystoscope was introduced and the bladder inspected. The ureters were catheterized and a sample collected for microscopic examina-

tion. A culture was made from each kidney on agar tubes.

"2. Four cubic centimeters of indigo-carmine solution containing 1 grain of the dye was injected into one of the veins at the bend of the elbow. The time of the appearance of the dye at the end of the catheters was noted on each side. A specimen for comparative microscopic study and a culture for comparison with the ordinary culture were taken.

"3. One cubic centimeter of phenolsulphonephthalein was now injected into one of the arm veins and the time of its appearance noted. A half-hour specimen was taken from each side and the bladder catheter-

ized to measure the leakage.

"4. Each specimen was diluted to 250 or 500 or 1000 c.c. with distilled water and sodium hydrate solution, 15 per cent., added until all traces of blue disappeared from the solution. The amount of phthalein was estimated in the colorimeter and recorded.

"5. The specimens collected from the catherers, both plain and in the

presence of indigo-carmine, were centrifugalized and examined.

"6. After twenty-four to forty-eight hours the two cultures were

compared.

"7. A few days later the patient was given an intravenous injection of 1 c.c. of phthalein after the bladder had been emptied by urination or catheterization and after about 500 c.c. of water had been drunk. At the end of thirty-five minutes the excretion was collected, read in the

colorimeter and recorded for comparison."

It was concluded that when indigo-carmine and phenolsulphonephthalein are excreted simultaneously the addition of sodium hydrate eliminates the color of the indigo-carmine and brings out that of the phthalein; that phenolsulphonephthalein is excreted by the kidneys in the same amount whether used alone or simultaneously with indigocarmine; that the presence of indigo-carmine does not interfere with the microscopic study of the specimen of urine; that the growth of

³⁰ Surg., Gynec. and Obst., 1917, xxv, 561.

²⁹ Tr. Sec. Genito-urinary Diseases, Jour. Am. Med. Assn., 1917, p. 229.

bacteria is not retarded by the presence of this dye in the culture; that a quantitative colorimetric estimation of indigo-carmine can be carried out.

Among the very few reports of injurious action from phthalein is the observation of Keith and Thomson³¹ of the reappearance of hematuria in acute war nephritis following the use of phthalein. Personally, I have

never encountered any harmful action from a phthalein test.

The fate of unexcreted phenolsulphonephthalein is of interest. A number of years ago in experimental nephritis I was impressed with the speedy and apparently complete disappearance from the animal's body of phenolsulphonephthalein when none had been excreted by the damaged kidney. Gone it was and no trace could be found, but where and how had it disappeared? Kendall³² has answered the question in some very interesting work. According to him phenolsulphonephthalein retention must mean phenolsulphonephthalein destruction. Experiment showed that phenolsulphonephthalein was reduced easily by nascent hydrogen but not destroyed by oxidation. When mixed with various tissues ground into a fine mash it was found that liver destroyed practically all, muscle and intestine a large percentage, and spleen, pancreas, lung and kidney practically none of the phenolsulphonephthalein. This appears to be an enzyme reducing action, as it is destroyed by heat and retarded by minute amounts of acid or alkali and by the presence of sugars and other substances.

The very low output of phthalein in chronic passive congestion when there is no nitrogen retention, I believe, may be the result of such a destruction of phthalein in the slowed circulation rather than due to the inability of the kidney to excrete the dyestuff. This would explain the apparent discrepancy in results of phthalein excretion and other renal

functional tests in cardiac and some other cases.

Sodium Chloride. Sodium chloride excretion is an important phase of the renal test meal already discussed. Disturbances in its excretion in these test meals furnish valuable information as to renal function. Wolferth³³ has published a study of the chloride excretory function of the kidney, using McLean's formula to express the relationship between the plasma and urine chloride. As an error occurs if there is an escape of blood CO₂, Wolferth prevented this by collecting the blood under albolene, as suggested by Van Slyke, in determining the carbon dioxide combining power of the plasma. His conclusions are as follows:

"1. An elevated plasma chloride threshold, when circulatory disturbances can be excluded, is valuable evidence of the presence of nephritis.

"2. A normal threshold may be found in cases with marked impairment of ability to excrete chlorides, particularly if the patient has been kept on a regime including salt-free diet and measures to stimulate elimination.

"3. Sodium chloride added to the diet is sometimes excreted as completely by impaired kidneys working under the stimulation of a high

Quart, Jour. Med., 1918, ix, 229.
 Jour. Am. Med. Assn., 1917, lxviii, 343.
 Am. Jour. Med. Sc., 1917, cliv, 84.

chloride content of the plasma as by normal kidneys working under normal threshold; added chloride may be retained when the threshold is normal.

"4. Chloride exeretory function is impaired in nearly all cases of nephritis.

5. Chloride excretory function is much more disturbed in eclampsia

than is urea excretory function."

Renal Function Following Acute Fevers. The slight albuminuria of acute infectious fevers is well recognized, but there is not very much data in regard to the effect that such renal changes have on renal function. Bookman³⁴ has sought to find this out by estimating the renal function in patients from three to fifteen days after the temperature had become normal following a fever. In his work he used phenolsulphonephthalein, blood-urea and the two-hour test following Mosenthal's diet as methods for estimating renal function. Fifteen patients were Most of these, without other signs of nephritis, showed definitely impaired function, and the greatest disturbance was shown by the phenolsulphonephthalein test. Frequently the patients showed a slight nocturnal polyuria. On account of these findings it seems to him wise to make allowance for a preceding febrile disease when the renal function of a patient is tested. Frothingham35 has made a somewhat similar study of renal function during, and immediately following, some of the acute infectious diseases. He studied a number of febrile conditions and found no evidence of serious renal involvement, as there was no constant impairment of renal function as shown by the tests. The McLean index, in a number of his cases, was abnormally high. His results seem to be slightly at variance with those of Bookman.

I believe this difference may have been due to the fact that Frothing-ham emphasized phthalein excretion, particularly during the febrile period, and his figures more often than otherwise show a higher excretion during the fever than when the temperature is normal. His determination with normal temperature was made shortly after the fever, while Bookman's observations were made after a rather longer interval. As has been shown in the study of cases of acute nephritis the figures for renal function are better during the more acute stage of the disease than at the period when the nephritis has cleared up somewhat, so that these results of Frothingham and Bookman, while differing slightly, are in

accord with the findings in acute nephritis.

Renal Function in Acute Nephritis. Mason,³⁶ in a very careful study of 3 cases of acute nephritis over a long period of time, found that in the very severe cases the renal function, during the early stages, is much better than the actual state of the kidney would seem to warrant. He explains this as due to the increased stimulation from which they are suffering. As the inflammation subsides, he finds that the function tends to fall to a very low level, which level is more truly an index of the kidney state. As convalescence progresses, the level of renal function tends to return to that which may be said to represent the permanent degree of

Arch. of Internal Medicine, 1917, xx, 112.
 Ibid., 1918, xxii, 74.
 Ibid., xxi, 216.

renal damage. This drop in renal function from that of the more acute stage takes place when there is going on a very marked improvement in the clinical condition of the patient, so that apparently renal function and the general condition of the patient are at variance. In his study, Mason has used the nephritic test meal, collecting the urine in two-hour specimens, the determination of the rate of excretion of urea and chlorides according to McLean's method and the phthalein test.

These findings of Mason in cases of acute nephritis are quite in accord with the observations that we have made here at the Peter Bent Brigham

Hospital on similar cases.

RENAL FUNCTION IN SENILITY. A study of renal function was made by Rappleye³⁷ on a group of 41 patients whose ages ranged from seventy to eighty-eight years. The patients were free from gross evidences of renal insufficiency or other compromising conditions (fever, edema, dysphea, anemia of note), and most of them were active workers. Under the conditions of diet and hospital routine the upper normal value of blood-urea-nitrogen is considered as 15 to 16 mgm, per 100 c.c., the blood being drawn before breakfast. Fifty per cent. of the cases studied showed a moderate degree of retention, using these blood-urea-nitrogen figures as a criterion. In 27 cases in which the elimination of phthalein was determined, 13 showed a value of 40 per cent. or lower; 9 of these were 35 per cent. or lower. A low value of elimination of the dye was associated for the most part with an elevated blood-urea-nitrogen. A good excretion was related for the most part with a relatively low blood-ureanitrogen. Fifty per cent. of the cases showed a systolic blood-pressure of 160 mm, or over; a higher percentage showed a diastolic pressure of 85 to 90 mm, or over. The blood-pressure readings cannot be said to be related to either the blood-urea-nitrogen or to the rate of elimination of phenolsulphonephthalein. Twenty-five per cent. of the cases showed albumin in the urine. There were no cases of glycosuria or hematuria. Practically all of the cases showed casts, a customary observation. Sixty-six per cent, of the cases showed either an elevated blood-ureanitrogen or a depressed value of phenolsulphonephthalein elimination.

Renal Functional Tests in Children. Hill³⁸ has applied renal functional tests to children. There is a great difference between nephritis as seen in adults and in children. In adults there may be recognized, broadly speaking, two great groups of nephritic cases: One dependent on acute infectious processes somewhere in the body, the toxins of which injure the kidneys either-temporarily or permanently; and the other, in which most of the adult cases fall, dependent on slow-going degenerative changes in the bloodvessels, which produce so-called "chronic interstitial nephritis" or "cardiorenal disease." Nearly all the nephritis in children depends on infection; for practical purpose the vascular or chronic interstitial type can be ruled out. Four methods of testing kidney function in children are discussed by Hill; the added salt and urea test, the phthalein test, the two-hour renal test and the determination of the concentration of urea-nitrogen in the blood. Of these

Boston Med. and Surg. Jour., 1918, elxxviii, 191.
 Amer. Journal of Child. Dis., 1917, xiv, 267.

tests the added salt and urea test is of little practical value in children. The determination of the blood-urea is probably of slightly more value. The most valuable of the four are the phthalein test and two-hour renal test because they are simple to carry out and because they give reliable and important information concerning the functional power of the kidney. These two tests supplement each other and more valuable information can be obtained by using them together than by using either one singly. High phthalein excretion alone does not help. High phthalein excretion, normal blood-urea and a normal response to the two-hour test, warrant a conclusion that the process is a mild one, that the kidneys are only slightly damaged and that there is a good chance for recovery. Moore³⁹ has similarly studied renal function in children, using the blood-urea-nitrogen, and the phthalein test as well as the test meal for renal function.

Comparison of Functional and Anatomical Findings in Nephritis. Stengel. Austin and Jonas⁴⁰ have observed a group of 30 cases of renal disease which has been studied by certain of the recently introduced methods of renal functional testing, and 15 of these died and came to autopsy. The cases of advanced chronic glomerular nephritis showed, in the most prominent degree, elevation of blood-pressure, depression of phthalein excretion, elevation of blood-urea, fixation of urinary specific gravity and the presence of albuminuric retinitis. The blood-plasma chloride level, however, was subnormal. Another group, spoken of as chronic parenchymatous nephritis, which substantially were cases of mixed glomerular and tubular nephritis, showed very slight elevation of blood-pressure, less marked depression of phthalein, less marked elevation of nonprotein nitrogen and a more nearly normal urinary specific gravity. The plasma chloride in 2 of these cases was above normal. The cases which clinically and histologically were cases of renal arteriosclerosis exhibited a variety of forms of kidney in the gross, and the blood-pressure especially the pulse-pressure, although much above the normal, was usually lower than in cases of advanced glomerular nephritis. The plasma chlorides were normal, the phthalein excretion was moderately good and the blood-nitrogen was moderately increased.

Blood Lipoids in Nephritis. Bloor⁴¹ has applied the methods devised by him for the study of lipoids in the blood to a group of cases of nephritis. With these methods the abnormalities in the blood lipoids in severe nephritis were found to be high fat in the plasma and corpuscles and high lecithin in the corpuscles. The cholesterol values are practically normal. These findings are the same essentially as found in alimentary lipemia, and for this reason are regarded as the results of retarded assimilation of the fat in the blood, which, in turn, is thought to be one manifestation of a general metabolic disturbance brought about by a lowered alkali reserve of the blood and tissues.

Bence-Jones Proteinuria in Hypertension. Miller and Baetjer¹² have studied 5 patients in whom they have demonstrated Bence-Jones

<sup>Northwestern Medicine, 1918, xvii, 78.
Arch. of Internal Medicine, 1918, xxi, 313.</sup>

Jour. Biol. Chem., 1917, xxxi, 575.
 Journal of the Amer. Med. Assn., 1918, lxx, 137.

proteinuria. None of these patients showed any evidence of bone-marrow or blood disease, such as multiple myeloma or myelogenous leukemia. All cases showed hypertension. Three patients showed numerous casts in the urine but excellent renal function. These were young persons. Two of the cases would be grouped as chronic nephritis with edema. This apparently is the first report of the finding of Bence-Jones protein in patients with hypertension and evidence of renal disease.

Diet in Nephritis. According to Chace,43 the regulation of diet is a very important part of the treatment of nephritis. In parenchymatous nephritis, in which the normal elimination of water and salt is impaired, dietary restriction of these substances is designed to reduce the tax on the kidney to the lowest terms. Here the water is limited by excluding beverages and other fluid foods and no salt is added to the food served to the patient, and no vegetables known to be conspicuously high in this element are included in the diet. In interstitial nephritis the most characteristic phenomenon is the lowered permeability of the kidney for the nitrogenous constituents of the urine. The more protein in the diet the more these substances accumulate in the blood, overtaxing the kidney and causing intoxication of the whole organism. Hence the first dietary consideration in these cases is limitation of the nitrogen intake. The patients used in the test have been followed not only by the usual clinical observations at the bedside but also by frequent chemical examinations of the blood. The determination of creatinin and urea-nitrogen affords an excellent and convenient means of gauging the kidney's capacity to eliminate nitrogenous waste products and of noting the response of the nephritic to treatment.

The plan of Chace for these cases provides for a diet adequate in calories, protein, mineral elements and food accessories. A warm, cooked cereal, generally faring, served with milk, is given for breakfast. This is sometimes changed to oatmeal or a baked banana and toast and a citrus fruit. At noon is served plain soup made of milk, flour and butter and celery, asparagus or spinach; a main dish consisting of baked potato or baked half-ripe banana and steamed rice; a liberal portion of green vegetable and a lettuce salad with oil dressing, flavored with lemon or vinegar. The evening meal consisted of such articles as ripe bananas, rice pudding, corn-starch blanc mange, steamed rice with baked bananas and stewed fruit. Milk and cocoa in limited quantities are served as beverage. Thus a good variety can be obtained. Green vegetables are given to bring an iron intake in excess of 15 mgm. per day. The sum total of the day's ash constituents should be decidedly alkaline in reaction and rich in calcium. The day's requirement for energy should add up to at least 2000 calories and the protein should not exceed 60 gms.

These views of Chace in regard to nephritis and his suggestions as to diet are in accord with those very generally held. Epstein⁴⁴ recommends quite a different type of diet for cases of chronic parenchymatous nephritis. According to him the characteristic change in the blood-serum in

⁴¹ Ibid., 1917, Ixix, 144.

⁴³ Journal of the Amer. Med. Assn., 1917, lxix, 440.

these cases is a reduction in the total protein content with a marked relative increase in the globulin which in certain instances constitutes nearly all of the protein present. This has resulted from the continuous albuminuria. According to Epstein⁴⁵ the marked edema of these cases results from this protein decrease in the blood serum, causing a decrease in osmotic pressure which favors the absorption or imbibition of fluid by the tissues. On the basis of the views expressed, the methods pursued in the treatment of these cases are the following:

In the less severe cases the patients are put on a high protein diet (from 80 to 200 gm. of protein daily), with a small quantity of carbohydrate and a total restriction of fats. The total food value of the diet ranges between 1200 and 2400 calories. In the very severe cases repeated transfusions of blood are resorted to, simultaneously with the administration of a high protein, fat-poor diet. At each transfusion (about 500 c.c.) an equal amount of the patient's blood is first removed. The effect of this procedure is threefold: (a) It ameliorates the anemia. (b) It increases the protein content of the blood-serum. (c) It diminishes the fat content of the blood.

As is to be expected, the effects of transfusion are temporary, but they serve to initiate the desired changes in the composition of the blood-serum. Chief reliance is placed on a high protein diet. The chlorides and the water are only moderately restricted. Improvement in the nutritional state of the patient is associated with the restoration of normal physicochemical conditions in the blood, by virtue of which a proper exchange of fluid between the tissues and the blood is reëstablished. This leads to the elimination by the kidneys of retained water and various organic and inorganic salts.

The Causation and Curability of Certain Long-standing Albuminurias. Cases of long-standing, but otherwise mild, albuminuria should not be looked on as incurable, according to Riesman, 46 unless evidence on the part of the cardiovascular system, or testimony given by functional tests, clearly demonstrates that the kidneys are diseased. This applies also to the so-called orthostatic or postural albuminurias of adolescents. The albuminuria may be kept up by disease of the tonsils (which is not always discoverable by simple inspection), by dental abscesses, by other infective foci or by the presence of a renal stone. It may be made to disappear entirely, at least, in some cases by the removal of the offending focus.

Quite analogous to Riesman's observations is one by Beifield⁴⁷ entitled "Orthostatic Albuminuria." A young medical student, aged twenty-one years, discovered, in a laboratory test, that his urine contained albumin in a large amount. Examination revealed that the tonsils were large and hyperemic and rather deeply buried; some of the tonsillar crypts contained plugs. The heart seemed somewhat enlarged. The abdomen was without changes and ankle edema was absent. The occurrence of the albumin was strictly associated with the assumption of the upright

Am. Jour. Med. Sc., 1917, cliv, 638.
 Jour. Am. Med. Assn., 1917, lxix, 2009.
 Jour. Lab. and Clin. Med., 1917, ii, 638.

position. The albumin amount varied, diminishing apparently as the day went on. In this case, after tonsillectomy in 1915, albuminuria persisted during a subsequent otitis media and then disappeared, and for the past eleven months has been absent at all times and by all tests.

The Effect of Transfusion in Severe Acute Mercuric Chloride Poisoning.

In an experimental study, Burmeister⁴⁸ concludes as follows:

1. Copious venesection followed by transfusion of normal blood inhibits, both qualitatively and quantitatively, the characteristic degeneration usually found in the epithelium of the ascending loop of Henle in the kidneys of dogs acutely poisoned by mercuric chloride.

2. In desperate and other cases of acute mercurial poisoning, venesection, followed by transfusion, should be practised in addition to other

therapeutic measures now in use.

3. Erythrocytes, from the blood of rabbits, when suspended in Ringer's solution are apparently not injured by a 3- to 4-volt electrical current passed through the solution for one-half to three-quarter-hour periods.

4. In this way metallic mercury can be removed in vitro from the blood of animals poisoned by mercuric chloride and this blood qualitatively freed from its corrosive contamination can be utilized in subse-

quent transfusions.

Etiological Diagnosis of Chronic Nephritis and Hypertensive Vascular According to Elliott, 49 general agreement exists that Degeneration. except in those rare instances of nephritis produced by chemical irritants, such as mercuric chloride, the invariable cause of acute inflammation of the kidneys is bacterial invasion from some primary source or focus situated elsewhere. The infective agent is usually, although not necessarily, the streptococcus. The fact that the search for the proper cause is often disappointing, and many times futile, need create no surprise. The original cause might have been tonsillitis. If the tonsils still harbor infection their removal may influence favorably the course of the kidney disease, but not necessarily so, because there may exist elsewhere, perhaps not discovered, a secondary infective focus which suffices to perpetuate the renal inflammation. On the other hand, the original focus of infection, be it in the tonsils, sinuses or elsewhere, may have long since disappeared and yet an infected gland, septic focus in the spleen or some similar bacterial localization may exist to the continuous detriment of the kidneys to form a cause of the chronic nephritis.

A subject of equal interest and of greater obscurity than the etiology of chronic nephritis is the proximal cause or causes of hypertensive cardiovascular renal disease, or what has been familiarly and perhaps wrongly designated "chronic interstitial nephritis." In 57 patients observed as to the condition of their teeth, 33 per cent. exhibited extensive pyorrhea or alveolar or tooth root infection, but whether this percentage of dental sepsis is significantly in excess of what might be expected in an equal number of persons beyond middle life without hypertensive cardiovascular-renal disease is hard to say. The per-

 ⁴⁸ Jour. Lab. and Clin. Med., 1917, ii, 500.
 ⁴⁹ Jour. Am. Med. Assn., 1917, lxviii, 1955.

centage with tonsil infection was not high enough to possess great etiological significance. Even syphilitic infection, while much more reasonable, owing to the sclerotic nature of the lesions, fails on examination to appear of great magnitude, for out of 33 patients examined, 32 gave a negative Wassermann reaction and only 1 reacted positively.

My own results⁵⁰ with this type of case coincide with those of Elliott. The views of Ophüls⁵¹ accord with those of Elliott in regard to the importance of bacteria in the etiology of some forms of nephritis. According to Ophüls there is a well-defined disease of the kidneys caused by general sepsis arising from some infected focus and often made progressive by the persistence of such a focus. Since the glomeruli in this disease show the most characteristic and constant lesions, it may be spoken of as glomerulonephritis, and as the lesions are so distinctly of an inflammatory type, as true nephritis. Experimental results seem to prove that the suggestion made by Ophüls some years ago on the basis of his findings on human material that the glomerular lesions in glomerulonephritis are probably embolic and due to the rapid lysis of the bacteria within the vascular loops of the glomeruli, is probably true. The type of bacteria concerned does not seem to be of much importance, provided that they possess certain endotoxins which become liberated on lysis. In the human being there is reason to believe that streptococci, colon bacilli and probably other bacteria may act in this way, although streptococci seem to be by far the most common organisms concerned in the causation of human nephritis. The disease occurs in three forms: the acute, the subacute and the chronic type.

Acute glomerulonephritis is usually due to some septic infection, preferable with streptococci arising in the tonsils or elsewhere. In the gross, the kidneys are intensely swollen, congested, full of petechial hemorrhages and often quite edematous, so that they may be considerably enlarged. The disease is especially common in children, and urinalysis should never be neglected in any case that seems at all suspicious, especially when the patients do not recover promptly and completely. A "generally run-down" condition and continued anemia are important signs. Unless the original septic infection kills the patient, or the infection heals completely, and the patient recovers, a subacute condition is

apt to develop gradually.

In the subacute form the disease often develops very insidiously. The kidneys become even more congested and swollen, and the hemorrhages continue. The necrotic spots in the diseased glomeruli and the coagulated exudate in them gradually become replaced by cellular connective tissue, which eventually destroys the glomeruli completely and converts them into an inert mass of fibrous connective tissue. Though hemorrhages persist, hematuria is less prominent. There is usually more or less edema; headache, nausea and vomiting appear, and there may be typical convulsions. The anemia commonly is severe and progressive. Neuritis optica, with retinal hemorrhages, may be observed, and in the later stages the blood-pressure climbs up. With severe lesions in the

⁵¹ Ibid., 1917, lxix, 1223.

⁵⁰ Christian, Jour. Am. Med. Assn., 1918, lxx, 1909.

kidney, phthalein excretion often is fair, even though blood-urea may go up to 100 mg. and more. The patients die of their septic condition, or, more commonly, of asthenia or uremia, but these cases last for months and years with exacerbations and remissions, and sometimes the patients

are fairly well for a long time.

Between the chronic form and the preceding one it is difficult to draw a sharp line of demarcation. Many of these chronic cases seem to be caused by a form of chronic suppurative tonsillitis due to diplostreptococcic infection in which the tonsil, on clinical examination, may show little change. The kidneys at necropsy are always much shrunken, either smooth or granular, or sometimes more coarsely lobulated. They show the characteristic microscopic picture of advanced renal sclerosis. The remnants of renal tissue are often so exceedingly small that it is a wonder how the individuals have been able to exist so long before they finally die of the disease. The blood-pressure is usually high and there is marked hypertrophy of the heart. Albuminuric retinitis is one of the first symptoms. Anemia is often well marked and sometimes severe. Edema may be prominent but there are the well-known "dry cases." The patients most commonly die in uremia or sudden death is produced by lesions of the brain, due either to vascular obstruction or to hemorrhage.

Chronic Nephritis Simulating Brain Tumor. Collins⁵² calls attention to the very striking simulation of brain tumor symptoms that may result from chronic nephritis. He describes a patient who for a year had had headache, giddiness, occasional unsteadiness in standing and walking, nausea, vomiting, failing vision and general weakness. The patient had vascular hypertension, polyuria, albuminuria and cylindruria, secondary anemia, dyspnea, headache, vomiting and choked disks. On treatment with forced fluid, calomel, hot packs and carbonic baths the symptoms mitigated. The elevation of the optic disks subsided and later a fairly typical retinitis albuminurica developed. (I have seen similar cases in

which the resemblance to brain tumor was very striking.)

Clinical Classification of Chronic Nephritis. According to Christian,⁵³ we are helped most if we consider our cases of nephritis as part of a large group that might be termed a cardio-vascular-renal group in which cardiac insufficiency from myocardial weakness, hypertension and defective renal excretion play the prominent part. Any attempt to group the cases solely on the basis of renal disturbance fails to give a proper understanding of the disease as we see it in our patients. In the grouping suggested above, vascular lesions constitute the most useful central grouping. Patients belonging to the cardio-vascular-renal group, which have as a common factor albuminuria and cylindruria in varying degrees, may be classified for clinical purposes as follows:

1. Patients with hypertension without definite cardiac or renal insufficiency; primary or essential hypertension. In some of these cases

albuminuria and cylindruria are only occasionally present.

2. Patients with hypertension with renal insufficiency, most of whom in

Jour, Am. Med. Assn., 1917, Ixviii, 1314.
 Cleveland Med. Jour., 1917, xvi, 223.

later stages show cardiac insufficiency; cardiorenal cases in the later stages.

3. Patients with renal insufficiency, with or without hypertension, the latter when present having developed secondarily to the renal insuffi-

ciency; chronic nephritis, with or without hypertension.

In Group 1 considerable edema does not occur. In Group 2 considerable edema is frequent and when present is usually of cardiac origin, though it may be of combined cardiac and renal origin. In Group 3 considerable edema occurs, but is not very frequently met with; when it occurs it is of renal origin. In these types where hypertension is present as the disease progresses, signs of chronic myocarditis usually appear until myocardial insufficiency becomes an important factor. In diagnosing these various types, the tests of renal function help very greatly in determining the part played by renal insufficiency in the symptom-complex.

Diuretics in Nephritis. Christian⁵⁴ summarizes his views as to the use of diuretic drugs in nephritis as follows: In uncomplicated nephritis of all types diuretics are either not indicated because there is no need for increased urinary output, or where there is a need for diuresis to remove edema or detoxify, they do no good. In other words, in nephritis as such they should not be used. Reduction of fluid intake, salt-poor diet, sweating and purging are better methods for removing edema. For toxic symptoms, bleeding, sweating and purging are more efficacious than diuretic drugs. On the other hand, in patients with cardiac insufficiency and relatively little organic renal lesion, diuretics are extremely useful to aid in the removal of fluid accumulated in the body. Under these conditions they seem to work best when given intermittently, in part because of their tendency to cause nausea, and in part because study of renal function indicates that frequently following very active diuresis renal function is temporarily depressed. They are most efficient when given after a short period of digitalis therapy. In the patient with edema of nephritic origin without cardiac insufficiency, digitalis alone, however, in my experience produces no diuresis, and when followed by a diuretic drug little or no increased urine flow results.

Renal Insufficiency in Urticaria. Longcope and Rackemann⁵⁵ have studied 6 cases of urticaria, 4 of which were hypersensitive to one or more foreign proteins. In one of these cases there was a renal disturbance limited to albuminuria and cylindruria, while in two others, in addition, there was an increase in blood-urea, profound depression of urea excretion, decreased output of phthalein and retention of chlorides and water, indicating a profound intoxication of body tissues during severe attacks of urticaria.

Osler, in his studies of the visceral crises of the erythema group of diseases, notes that several of his patients died with symptoms causing the diagnosis of uremia to be made. In a report of my own cases⁵⁶ of this group I have noted evidences of renal lesion. All of these studies indicate that in urticaria and erythema we are dealing not with local skin lesions but with very general disturbances which may affect various organs of the body singly or in combination.

56 Christian: Jour. Am. Med. Assn., 1917, lxix, 325.

⁵⁴ Canadian Pract. and Rev., July, 1917.
⁵⁵ Jour. Urology, 1917, i, 351.



GENITO-URINARY DISEASES.

BY CHARLES W. BONNEY, M.D.

DISEASES OF THE KIDNEYS AND URETERS.

Gunshot Wounds. By this term, as used here, is meant wounds of the kidney which are inflicted in warfare by any kind of firearm. During the year several papers on the subject have been contributed by military surgeons, notable among the number being those of Major Maurice Chevassu,¹ Colonel Andrew Fullerton² and Major Nogues.³ The lastnamed surgeon saw his patients at the casualty clearing station, Colonel Fullerton's experience was obtained at a base hospital in France, and Chevassu saw patients both at the Front and at the base hospital. Although all of them report a considerable number of cases, there are certain striking differences in the exact nature of the injuries inflicted and the sequence of events in the different groups of patients.

Chevassu presents an analysis of 56 wounds, 46 of which were recent and 10 old. He states that although a considerably larger number of renal wounds were treated in his service, none were included in this series in which there could be the slightest doubt as to the nature of the injury, for either the kidney itself was inspected or an accompanying hematuria or discharge of urine through the wound made its nature plain. In his experience, however, the latter occurrence was rare. The passage of bloody urine also was by no means a constant symptom. The author remarks that when it is not present the involvement of the kidney in the injury may readily escape attention at the first aid station, especially if the patient be examined at night. Thus, he found that in 12 cases in which the kidney was exposed by incision, in only 5 had blood been passed per urethram.

Secondary hematuria was observed only once in this series of cases, developing suddenly on the tenth day and being very profuse. In fact, the author states that he has never seen so much blood voided as in this case. In all of the other cases the bleeding was insignificant and lasted only a few days, sometimes stopping after the first twenty-four hours, or even after the first micturition. Colonel Fullerton also reports a case in which the first indication of renal involvement was the occurrence of a formidable hematuria on the twelfth day after the injury. He cystoscoped the patient and found a string of blood-clots protruding from the right ureteral orifice. The urine from the left side was normal. The kidney was removed immediately, and, when examined, it was seen

¹ Bull, et Mém, de la Soc. de Chir, de Paris, January 22, 1918.

British Jour. of Surg., October, 1917.
 Journal d'Urologie, March, 1918.

that a fragment of shell had passed through its lower pole. This patient recovered, as did likewise Chevassu's.

In addition to this case, in which the hemorrhage developed on the twelfth day, Colonel Fullerton states that similar bleeding occurred in 8 other cases out of 42 which he saw at the base hospital. In 1 case it came on as early as the third day, and, in 2, as late as four weeks after the injury. There were 2 cases in which hemorrhage took place through the external wound and 2 in which blood was effused into the perirenal tissues. Most common after shell wounds, it may, nevertheless, occur after simple bullet wounds. In five of Chevassu's cases also a perirenal hematoma formed, producing a swelling in the lumbar region which was easily recognizable by sight. Two patients so affected were operated upon the fifth day after the swelling appeared, the author being led to interfere because high fever developed. In one of these cases the kidney was found split at its inferior pole. The wound was left open. This case terminated fatally. In the other case the clotted blood was removed and drainage instituted, the patient making a good recovery, so that he was discharged well at the end of a month and a half. In the three remaining cases in which no recourse to surgery was had, all the patients did well, although some elevation of temperature persisted for a number of days. One was discharged on the fourteenth day, one on the twenty-fifth day and one on the forty-ninth day.

In regard to the cases of secondary hemorrhage, it is plain that certain structural peculiarities of the kidney predispose to it. First, as has been mentioned in a previous review in Progressive Medicine, there is no anastomosis between terminal branches supplying different areas of the kidney; hence the necrosis which occurs in the areas deprived of their blood supply by severance of the nutritive vessels tends to disseminate sepsis which, as is well known, predisposes to hemorrhage. Furthermore, the differences in blood-pressure within the kidney may serve as a predisposing factor, and, finally, the great vascularity of the organ undoubtedly causes it to bleed more freely than others not so abundantly supplied. In one of Colonel Fullerton's cases it was found postmortem that an artery supplying the inferior pole of the kidney had been severed by the missile and that the lower pole of the organ was necrotic. The appearance of the kidney in this case is shown by the accompanying illustration. This patient lived fifteen days after he was shot, and although he did not develop a secondary hemorrhage, probably succumbing to sepsis, it is very likely that profuse bleeding might have taken place had he lived long enough for the necrotic part of his kidney to slough away.

In regard to the treatment of bleeding from the kidney, as might be expected, none of these military surgeons advise immediate operation unless bleeding is so profuse as to threaten life. Thus, if the kidney has been so badly damaged that it bleeds profusely through the external wound, its immediate removal is indicated. So, too, if there be a formidable and persistent hematuria, it should be removed. Chevassu states that conservatism should be taught the younger surgeons in charge of the first aid stations, so that they will not operate upon patients who are

in no danger of bleeding to death; and, furthermore, he points out that they should be made to realize that in the majority of cases the kidney itself is capable of bringing about hemostasis. Certainly this teaching is commendable and quite in accord with the results of observation in civil practice, to which reference has been made in this review on at least two occasions when rupture of the kidney was discussed. Chevassu has very little faith in the power of gauze packing to control renal hemorrhage. He speaks very highly, however, of transfusion of citrated blood in cases in which the patients have been nearly exsanguinated.

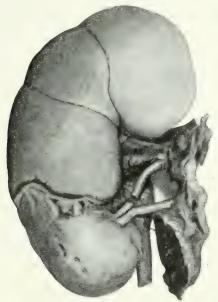


Fig. 3

Colonel Fullerton devotes considerable space to a discussion of the treatment of secondary hemorrhage. He is of the opinion that if bleeding is persistent after the tenth day and of such quantity as to cause anemia, too much time must not be lost in deciding upon operation. In regard to partial nephrectomy, Fullerton realizes that every case must be decided upon its own merits and that great responsibility must be assumed by the surgeon who makes up his mind to do this operation. In a few cases in which he examined kidneys that had been removed, he was under the impression that resection of the damaged part might have been successful. Whatever operation is done, the author feels that the patient's interests will be best served by removing clotted blood from his bladder, and for this purpose he has found Bigelow's evacuator very satisfactory. He holds the opinion that when this instrument is available it will very rarely be necessary to do a cystotomy. Nogues also is of the opinion that if an infarct of limited extent be found when the kidney is exposed, partial nephrectomy may be attempted.

Although Chevassu observed only 1 case out of 56 in which urine escaped through the wound, in Fullerton's series there were 9 out of 42 in which this phenomenon was observed. Two patients so affected were found to have sustained an injury to the ureter, and in the history of several others it was stated that the renal wound had involved the pelvis. Leakage may take place shortly after the injury, or it may be delayed until sloughing of a portion of the wall has occurred. Thus, in 1 case in which a retroperitoneal hematoma was found at operation, the urine was not discharged through the wound until a week later. After a few days its discharge may cease, or it may continue for several months. None of the cases of this series required any treatment for the closure of the urinary fistula, but it is not to be assumed that spontaneous healing will always take place. Fullerton predicts that some of these patients will later develop hydronephrosis from contraction of the scar in the ureter or in the neighboring parts. Naturally, if urine accumulates in the tissues, it must be let out by incision. The author has not observed any bad results from the flow of urine over the wounded surface.

Infection, as well as hemorrhage, constitutes one of the principal dangers in wounds of this kind, although it would seem that foreign bodies, such as fragments of shells, may be retained in parts superficial to the kidney without doing very much damage. Such, at least, has been Chevassu's experience. It must be remembered, however, that a large number of his patients were seen at the Front, so that he was not in a position to judge what trouble these foreign bodies might eventually cause. Certainly it would seem wiser not to indulge in meddlesome surgery at the first aid station. Whenever retained foreign bodies begin to cause disturbance, they can be removed, and the chances are that they will not make their presence seriously felt for some time after they have

gained access to the tissues.

In all of these series of cases some of the patients presented associated injuries. The lungs, liver, spleen, pancreas, stomach, small and large intestines, as well as the spine and lumbar plexus, were occasionally involved. Shock, vomiting, distention, together with tenderness and rigidity of the abdominal wall, were common symptoms, and Chevassu states that some of his patients showed a certain amount of contracture of the parietes on the affected side. The 10 patients seen by the latter author who were suffering from old wounds had been injured at periods varying from five months to one and a half years. None of them had been operated upon immediately after they were wounded, although 3 had been subjected to secondary operation. Functional examination of these patients showed that the injured kidney was doing its work in a normal manner, and the author rightly states that this finding constitutes another reason for conservatism in the surgical treatment of renal wounds.

Tuberculosis of the Kidney. In an excellent paper which he states was written especially for the general practitioner, Eisendrath⁴ discusses the diagnosis and treatment of renal tuberculosis, first pointing out three

⁴ Illinois Med. Jour., August, 1918.

facts with which it is essential for the practitioner to be familiar. These facts are (1) that the tubercle bacilli are carried to the kidney through its afferent bloodvessels in about 90 per cent. of all cases; (2) that in about 90 per cent. of the patients the disease occurs primarily in one kidney and is confined there for a period of months or years; (3) that from the kidney first involved the infection is carried to the bladder in the urine, so that unless the diseased kidney be removed at an early period in the evolution of the disease, the infection may ascend from the bladder to the healthy kidney on the opposite side. Recognition of these facts should enable the practitioner to make an earlier diagnosis.

The pathology is also carefully described, as the author feels that a thorough knowledge of the evolution of the tissue changes in the kidney, ureter and bladder will make the interpretation of the clinical symptoms easier, as well as the findings of the modern diagnostic methods more intelligible. He explains how the infection is carried from the papillæ through the blood and lymph vessels to all portions of the kidney, a circumstance which shows that resection of the primary renal focus would be useless. The primary focus undergoes the characteristic changes of tubercle formation, so that at an early stage the mucous membrane covering the papillæ is destroyed, thereby allowing the tubercle bacilli to escape into the urinary stream and become disseminated throughout the tract. In like manner erosion of bloodvessels gives rise to the slight hemorrhages which constitute one of the common symptoms of the disease in its early stages. The author shows how this process of tissue destruction may be continued until there is nothing left of the renal substance.

He also calls special attention to the fact that even in this terminal stage active bacilli are present and constitute a great menace to the patient. In the first place there is the danger of a generalized miliary tuberculosis even when an apparent anatomical cure has resulted from the destruction of the kidney, and, secondly, the danger of involvement of other organs, especially the opposite kidney. Great stress is placed upon these dangers by the author, who states that if some of those who advise non-operative measures were to see the evil results of their advice, they probably would quickly change their opinion and no longer continue to point to the complete destruction of the kidney as proof of cure of the disease. It is unfortunately true that all those who do renal surgery see patients who should have been subjected to nephrectomy long before they consulted a surgeon. Continuing with the discussion of the pathology. Eisendrath explains the manner in which closed tuberculous pyonephrosis is formed—namely, by contraction of the ureter from the healing of ulcerations. In regard to the changes in the bladder, the importance of edema at the ureteral orifice on the affected side is fully explained. It is also shown how this edema is followed by the formation of tubercles, which in turn break down and give rise to ulcers.

In discussing the symptomatology the author enumerates five symptoms, any one or more of which should at once lead the physician to refer his patient to a specialist. In their order of frequency these symptoms may be summarized as follows: Those of an ordinary cystitis

which fails to yield to the usual therapeutic measures; initial and repeated hematuria; dull ache or coliky pain referable to the kidneys; fever and chills with localization of inflammatory signs in the kidney; and, finally, enlargement of the kidney associated with constitutional disturbances. These are, of course, symptoms the importance of which are familiar to all genito-urinary surgeons, but upon which the general practitioner is apt to place too little importance. In the vast majority of cases the first thing that the patient complains of is some disturbance of micturition. He notices an increased desire to urinate, at first only at night, or perhaps only during the day, but later the urgency is present both day and night. At first urination is not painful, but after a short time it becomes so, especially as the last portion of the urine is being voided. After a while some blood appears as the last drops of urine are voided, and, if the patient has not already consulted his medical adviser, this last symptom will lead him to do so. As Eisendrath points out, the physician is very apt to make a diagnosis of cystitis or "cold in the bladder," and prescribes internal treatment, or perhaps vesical irrigations, neither of which affords relief; in fact, they may make the patient worse.

If patients so complaining were immediately subjected to the modern methods of examination—namely, examination of the urine for tubercle bacilli, cystoscopy, ureteral catheterization and functional renal tests—the true nature of their trouble could be learned at once and proper treatment, that is, nephrectomy, be applied immediately. The only contraindications to operation are advanced tuberculosis in other parts of the body or involvement of both kidneys. Other conditions, for example, tuberculous disease of the spine, may make the operation somewhat difficult technically, but, if the bone disease be latent, operation should always be undertaken.

I have recently removed a large tuberculous kidney from a woman who had a marked kyphosis and in whom the space between the ribs and the crest of the ilium was scarcely more than a finger's breadth in width. Partial division of the quadratus lumborum muscle rendered the exposure of the upper part of the kidney quite easy, and, after the pedicle had been divided, the kidney was lifted out of the wound without any trouble. The muscle was sutured.

Eisendrath states that in a recent case he obtained a most striking amelioration of the bladder symptoms, which persisted for a considerable time after removal of a tuberculous kidney, by the use of mesothorium. It was kept in the bladder for twenty-four hours, in the same manner in which it is employed for vesical cancer, which is described in Progressive Medicine this year.

Another paper having the same object in view was presented at the 1917 meeting of the Nova Scotia Medical Society by D. W. MacKenzie, of Montreal. During the three years prior to the presentation of his paper, MacKenzie states that the average duration of symptoms in the patients whom he operated upon for renal tuberculosis at the Bellevue

⁵ Canadian Med. Assn. Jour., January, 1918.

Hospital, Montreal, was two years and that the pathological findings indicated the disease had lasted even longer. Of 15 other cases which he treated at the Royal Victoria Hospital in a period of four months, 5 showed symptoms of more than three years' duration, 6 more than one year and 4 less than one year. In 3 of these cases a cystotomy had been performed, and in 11 the patients had been subjected to vesical irrigations for periods varying from six months to three years. Mac-Kenzie asks why these patients had been allowed to go so long without proper treatment, and answers the question himself by stating that a thorough knowledge of genito-urinary tuberculosis is not possessed by general practitioners, that surgical treatment is not generally recognized by them as being the best, and, finally, that in the majority of cases the symptoms of which the patients complained were not severe for a considerable time after their onset. He makes the remark, which impresses me as being very timely, that a slight persistent irritation of the bladder. which does not yield to ordinary therapeutic measures within a reasonable time, is just as suggestive of renal tuberculosis as a slight persistent cough is suggestive of pulmonary tuberculosis.

MacKenzie also traces the pathological changes in the urinary tract which occur as the tuberculous infection advances, believing with Eisendrath that a knowledge of them will better enable the practitioner correctly to interpret the clinical findings and understand the necessity for prompt surgical treatment. He also dwells at length upon the different methods of diagnosis, and includes in his paper a description of the routine schedule which he has adopted as a working basis for the staff of the Royal Victoria Hospital. It is very complete, including a general and urological history, a physical examination, both general and urological, urinalysis, renal functional tests, x-ray examination, cystoscopy and ureteral catheterization, and, in septic cases, a culture of the blood.

Given a case in which renal tuberculosis is suspected, the *sine qua* non of diagnosis is cystoscopy and examination of the urine obtained separately from each kidney. If physicians can be taught to have their patients so examined, there will be no trouble in making earlier diagnoses, and it seems to me that an effort should be made to familiarize them with the clinical picture of incipient and advanced tuberculous disease of the

kidney, just as is being done in cancer,

MacKenzie also discusses the so-called spontaneous cure of renal tuberculosis brought about by occlusion of the ureter, and although he mentions one patient in whom that condition had evidently been effectuated, he recegnizes that its occasional occurrence does not detract at all from the necessity of nephrectomy in every case. This question of autonephrectomy, so-called, is one that should not be discussed any more. There is no more reason for condemning the patient to wait for its occurrence than there is for withholding operation from a person suffering with acute appendicitis, because it is known that sometimes an attack of the latter will subside without operation. The one treatment for unilateral tuberculosis is nephrectomy, provided that there are not active tuberculous lesions in other parts of the body which contraindicate the operation.

As illustrative of the thought which has been devoted to this subject during the past few years, a paper by H. G. Bugbee, of New York, is well worth perusal. This author makes a careful review of the more important contributions to the literature which have been made since 1913, and also gives expression to his own opinions. It is hardly necessary to say that the consensus of opinion, as elicited by Bugbee's investigation, corresponds essentially to that expressed by the two authors previously cited as well as by the reviewer. A matter that surprised me not a little in going over Bugbee's paper was the gist of some quotations he made from a few authors, who apparently still hold to the antiquated and erroneous idea of medical and expectant treatment. I thought that the question had been decided a dozen years ago; certainly, that was the opinion of some of the best European teachers at that time. It is quite a different thing to place certain patients upon a preliminary course of treatment for the purpose of getting them into the best possible condition before operation. As Bugbee remarks, patients so treated will come to operation with more bodily resistance and will stand the shock of the anesthetic and the operation better than if the operation be done without such preliminary treatment. Yet the time always arrives when it is evident that nothing further can be gained by dietetic and hygienic measures. There are also certain patients with advanced lesions who fail to respond sufficiently to these measures to warrant their continuation. I have very recently operated upon such a patient, who, after two weeks of rest and forced feeding, was not a particle better, and perhaps a little worse, than he was when I first saw him. In the cases which come to the surgeon early it seems to me that the earlier a patient is sent to the hospital and operated upon, the better. Of course, this question can be satisfactorily disposed of by saying that each case must be treated upon its individual merits. In some there is much to be gained by preparatory treatment, in others little or nothing.

Bugbee's statistics show that 75 per cent. of the cases of unilateral infection can be cured by nephrectomy. Despite this high percentage, he thinks that the tendency is to be too optimistic in regard to the future of patients who have been operated upon, and insists that all should be kept under observation and be watched carefully for the slight-

est manifestation of tuberculosis in any part of the body.

Leo Buerger' reports 3 unusal cases of renal tuberculosis. In one of them the tubercle bacillus was found in the urine, and the patient suffered from the usual manifestations of the disease. At operation, however, the kidney was found to be practically normal in appearance, and it was only after several sections had been made through different parts of the organ that typical ulcerative and caseated lesions were found in one of the calices. The ureter, however, was markedly diseased. In another case the parenchyma showed no changes whatsoever, but there was a small indurated ulcer on one of the papilla. The third case was one in which a solitary papilla was markedly involved, as well as one of the calices. On the external surface of the kidney there was no evidence

⁶ Surg., Gynec. and Obst., May, 1918.
⁷ New York Med. Jour., January 5, 1918.

of tuberculosis nor did bisection of the organ at first sight show any morbid changes. It is safe to predict a favorable outcome in all of these cases. They were diagnosticated early as all cases should be and the

proper treatment applied.

Chronic Non-surgical Pyelitis. Joseph C. Sargent, of Milwaukee, presents a paper based upon a series of cases of pyelitis studied at the Brady Institute at Johns Hopkins Hospital. All patients were excluded whose record did not show conclusive evidence against the possibility of some predisposing anatomical or pathological condition of the kidney or its pelvis. Particular attention was given to histories of any chronic condition which might have furnished a focus from which organisms infecting the renal pelvis could have been derived. The cases of 75 patients affected with pyelitis were reviewed. Out of this number there were 35 who had a simple pyelitis, 16 of them having foci in some part of the body from which bacteria might possibly have been constantly supplied to the kidneys. Of these 16, 10 had some intestinal disturbance, and the author states it is noteworthy that all of them were affected with colon bacillus pyelitis. Three of the other 6 patients had a bacillary infection and 3 a coccal infection. Of the 3 with bacillary infection, 1 had pyorrhea alveolaris and tooth abscesses, 1 had suffered from an attack of influenza, and 1 was found to be affected with a traumatic sinus of the deep urethra. Of those having coccal infection, 1 suffered from chronic otitis media, 1 from chronic osteomyelitis, and 1 from chronic gonorrheal urethritis, the renal infection in the latter also being Neisserian. In the entire series of cases, however, there were but 3 in which the author felt that the pyelitis was really caused by a focal infection. In one of these cases the patient had suffered from a bilateral staphylococcus and colon bacillus pyelitis, which lasted three months, and had followed a second attack of appendicitis. Another had been affected with a bilateral staphylococcus pyelitis for four years, which was associated with suppurating middle ear disease. While he was under treatment at the Brady Institute his urine became free from organisms for a time, but later the infection returned and did not yield to treatment. In this case the author believes there was strong evidence to show that the trouble in the kidney was caused by the disease in the ear. In the third case there had been a bilateral colon bacillus pyelitis, which dated back twenty years, having supervened upon an injury to the deep urethra. The patient failed to improve under lavage of the renal pelvis until a sinus or pocket was discovered in his prostatic urethra, from which pus could be seen to escape. After the suppuration in this little diverticulum had been cured by the application of silver nitrate, the pyelitis likewise yielded to irrigations with a solution of the same salt.

These cases remind me of a case of acute tonsillitis in which the patient developed not only a pyelitis but apparently an acute nephritis of considerable severity. No local treatment was necessary in this case, for his urine began to clear up as the tonsillar infection subsided, and became entirely free from abnormal elements within a few weeks after his

⁸ Wisconsin Med. Jour., March, 1918.

tonsils had been removed following the cure of the acute inflammation. A similar case was recently brought to my attention by David Riesman, of Philadelphia. While they do not exactly parallel the cases of chronic focal infection such as Sargent describes, it nevertheless seems interest-

ing to mention them here.

Sargent states that the majority of cases of non-surgical pyelitis are caused by bacilli of the colon group and that many of them are associated with intestinal disturbance. Therefore, he considers it not only advisable, but imperative, to carefully examine for any intestinal lesion when a patient presents himself suffering with this form of bacilluria. Some years ago pyelitis developing as a complication of furunculosis was discussed in this review, and, in the light of our present knowledge, it would seem that any suppurative infection, whether acute or chronic, may give rise to suppuration in the kidney or its pelvis.

As to treatment, Sargent recommends pelvic lavage with silver nitrate solution, used at first in the strength of 1 per cent. and then increased to a 2 per cent, solution if sufficient reaction be not obtained from the first application. His idea is to produce enough irritation so that the patient will be well aware that something has been done. This has not been difficult to accomplish in the cases of which I have personal knowledge. Sargent has found, however, that some patients will not experience a sufficient reaction until a 5 per cent. solution has been used. Among the number treated at the Brady Institute there were 4 who came under this category; one received six irrigations with a 1 per cent. solution without deriving any benefit whatever, but was cured by a single injection of a 5 per cent. solution, which produced a moderate reaction. This advice of Sargent that we should use stronger silver solutions if the weak ones do not produce results, seems to me to be very timely. I have long been an advocate of fairly strong silver solutions in the urethra and bladder, and see no reason why they should not be used higher in the urinary tract. It is interesting to note that Sargent was disappointed with urinary antiseptics, urotropin included. He uses the latter drug, however, because of its power to inhibit the growth of organisms in the bladder, giving it in large doses every four hours.

Culver, Herald and Phifer⁹ have studied 116 cases of non-surgical renal infection, with special regard to symptomatology, bacteriology and treatment. The most prominent symptoms were chills and fever, pain in the back and frequent painful micturition. In many cases, however, they may be absent, so that of two patients having an infection that is identical bacteriologically, one may present them and the other may not. Pain in the back varies in type and severity from a dull ache to an acute sharp pain associated with tenderness through the lumbar region. It may extend down the thigh or into the pelvis and may be associated with severe pain in the abdomen. The latter too may occur independently of the lumbar pain, and like it, may vary accordingly in its degree of severity, sometimes being so acute as to lead one to sus-

pect the presence of serious intraperitoneal disturbance.

The fever in these cases was often more variable than the pain. It is almost always intermittent. It was as low as 101° F. in some cases and went up to 105° F. in others. The more acute the infection the higher the fever. In chronic cases there may be no rise of temperature. In common with the findings of other investigators, these authors found the colon bacillus and the staphylococcus to be the most frequent offenders. Their percentage of colon bacillus infections, however, was somewhat higher than that found by others, being present in 85 per cent. of the total number, 75 per cent. being pure colon bacillus infections. The staphylococcus was found in 19 per cent. of the cases and 9 per cent. of all gave pure cultures of the organisms. In 2 cases the trouble was due to the leptothrix. Other microörganisms found were the typhoid

bacillus, the Bacillus pyocyaneus and a diphtheroid bacillus.

Treatment consisted in pelvic lavage and the internal administration of urinary antiseptics. In the colon bacillus infections, urotropin and alkalies were administered alternately for a week at a time. In the staphylococcus infections the urotropin was used steadily, combined with benzoic acid or acid sodium phosphate. The authors believe that urotropin does good in these infections, especially in the colon bacillus form, when it is used alternately with sodium bicarbonate or citrate. The strength of the silver solution used for washing out the renal pelvis varied from 1 to 3 per cent. The lavage treatments were given every fifth day, varying in number from 1 to 12, from 3 to 5 being the average required to effect a cure. Thirty patients in the series were treated until they were fully cured. A great many did not come back after the subjective symptoms were relieved. Some refused to continue with the pelvic lavage because of the discomfort it caused them. The authors, however, consider it very important to continue the treatment until all infection is eradicated. To be practically certain that such a condition has been attained, they believe that two sterile urines should be secured by ureteral catheterization, the second being taken a week after the first one. The staphylococcus infections are undoubtedly more difficult to cure than those caused by the colon bacillus. This view is well corroborated by the results obtained in this series of cases, for of those cured 90 per cent. were colon and only 10 per cent. staphylococcus infections. It is interesting to note that 5 of the latter were treated for months with only temporary or quantitative bacteriological improvement.

Perirenal Hematoma. In Progressive Medicine for 1912 non-traumatic perirenal hematoma was discussed and a case which occurred in the practice of Seidel was reported, together with 2 others which occurred in Schmorl's practice. When he reported his case, Seidel was able to collect only 15 cases from the literature, but he evidently overlooked 2 other cases reported in the years 1911 and 1912 by Russell Fowler and

Schlichting.

About a year and a half ago a case of this kind came under my observation, 10 so that my interest in the subject was renewed and I endeavored to collect all cases that had been reported since Seidel's paper.

¹⁰ Urolog. and Cutan. Rev., August, 1918.

Milton K. Meyers, who reviewed the literature for me, was able to find recorded only 2 more cases, which brings the total number, so far as

can be ascertained, up to 22.

A study of these recorded cases shows that they may be divided into two classes—namely, those in which the bleeding took place from the kidney itself and those in which the origin was extrarenal. The first named may result from any inflammatory or suppurative disease, hydronephrosis, tuberculosis, or sclerosis of the renal vessels, but in the majority of cases the kidney itself is the starting point of the hemorrhage. In those subjects upon whom autopsy was practised, it was usually impossible to find an injured vessel of any size from which the bleeding had occurred, a circumstance which shows that the hemorrhage most commonly takes place from erosions of very small vessels. In regard to extrarenal causes, it may be of interest to note that the bleeding has come from the quadratus lumborum and psoas magnus muscles and also from the suprarenal bodies. In 2 cases of this kind the patients were hemophiliacs.

The symptoms usually develop suddenly, the patient being seized with sharp pain in the loin and abdomen, which soon becomes associated with elevation of temperature and the development of a painful mass in the lumbar region. As pointed out by Seidel, there is almost always some peritoneal irritation. Severe shock also is commonly present and in some cases the patient loses consciousness as the result of loss of blood after the hemorrhage has continued for some time. Naturally, one would expect the signs of internal hemorrhage in varying degree, and they were thus present in this series of 22 cases. In the case which came under my observation it seemed that the symptoms were more gradual in their development than in the majority of recorded cases, and I believe that repeated small hemorrhages had occurred before any

considerable amount of blood was effused.

My patient was a man, aged sixty years, who gave a history of having passed blood and stone more than thirty years ago. His last illness began with slight pain and stiffness in the back, together with an elevation of temperature varying from 99° to 100° F. These symptoms he attributed to a cold contracted in a sleeping car. A simple remedy was prescribed and the patient was sent to his country house for a rest. A few days later he suffered a slight attack of faintness, after which he complained of pain and soreness in the back. I visited him the next day but could not find anything indicative of serious trouble. Shortly afterward, however, a similar attack of faintness, though more severe, occurred. The patient complained of weakness, and stated he became exhausted when he went from his sleeping room to the bath room.

Examination after this attack revealed some abdominal distention and a certain fulness in the left loin. He was also somewhat tender to pressure in this region as well as over the left side of the abdomen. It being apparent that there was something radically wrong with him, he was removed to the Jefferson Hospital and placed under careful observation. During the next few days he became much worse. He had one

attack of syncope and developed a high fever, which at times remitted in the morning and at times was high early in the day and low at night. The question of a malignant intraperitoneal or retroperitoneal growth arose, and some plausibility of its existence was afforded by the fact that the patient had lost considerable weight during the preceding winter and spring. The presence of a perinephric abscess also seemed very plausible, and it was decided to incise the loin and see if pus could not be liberated.

The usual lumbar incision was made, and after dividing the muscles and the anterior layer of the renal fascia a mass of coagulated blood, which had completely distended the space between the fascia and kidney, was reached. Some of this clot was removed very easily, but the deeper portion was firmly stratified and was found to be about one-half or three-quarters of an inch in thickness. When the kidney finally was exposed it was found that the cortex over the lower pole was necrotic, the true capsule having given way by the pressure exerted by the effused blood. After the blood-clot had been removed the kidney was exposed from pole to pole and was found to be diseased throughout. It was found impossible to lift it out through the incision. Medially, it seemed to be matted to the wall of the great vessels. Therefore, it seemed better to lay it wide open and drain than to attempt a nephrectomy, reserving the latter operation for a later date in case the patient should survive. Unfortunately, he died a few hours later.

It also seems unfortunate that the diagnosis could not have been made earlier in this case. In this respect the case conforms to the majority of the 22 recorded cases in which the true character of the trouble was not discovered until operation or autopsy. In 21 cases of this series the outcome is known; 6 patients not operated upon died; of the 15 who were operated upon, 7 died and 8 recovered. Therefore, it is plain that every case should be considered a surgical one, and operation per-

formed as soon as possible.

In reporting this case to the Philadelphia Genito-Urinary Society I took occasion to remark that much of the ill-health which the patient had suffered was undoubtedly caused by a renal lesion of long duration and that a nephrectomy, or even a nephrotomy, performed twenty-five to thirty years ago, would have been highly beneficial. His case obviously belongs in the category so admirably described by Dr. Bransford Lewis a few years ago—namely, that of patients who suffer for years from renal infection, the true nature of which is not discovered as early as it should be. Much of my patient's ill-health had been attributed to an old lesion which he had in one lung, but in view of the history of his case and its termination there can be no doubt that he had had a long-standing focus of infection in the left kidney.

Spontaneous Duodeno-ureteral **Fistula**. Duodenal fistula following nephrectomy has been mentioned in a previous review. A very rare condition of spontaneous fistula between the duodenum and ureter has recently been reported by Edwin G. Davis, ¹¹ of Johns Hopkins Hospital,

who was unable to find any similar case recorded in the literature. case was that of a man, aged twenty-nine years, who complained of frequent and painful micturition, and who gave a history of an attack of fever associated with pain in the right lumbar region four years before he came under the author's observation. Subsequent events made it seem likely that he had had a perinephric abscess. Urine examination, made after his admission to the hospital, showed pus and numerous bacteria, both bacilli and cocci. The urine obtained from the left kidney by the ureteral catheter was normal, but that from the right kidney was turbid and of a greenish tinge and contained an abundance of mucus, some pus and epithelium, and a few bacilli. There was no excretion of phenolsulphonephthalein by the right kidney, and urea was likewise absent. Although the resemblance of the greenish fluid to bile was noticed, the possibility of a biliary content in the renal secretion was not seriously considered, so that tests for bile were not made. Pyelography failed to reveal any marked change in the contour of the renal pelvis. At the level of the border of the third lumbar vertebra, however, close to the ureteropelvic junction, a small mass of thorium was seen projecting upward, outward and backward from the line of the ureter for a distance of one centimeter. It was thought that this little diverticulum might possibly be a portion of a double ureter, the remainder of which had not been distended by the injecting fluid. Operation was decided

The kidney was found firmly bound down, and after it had been freed from adhesions and delivered, it was found that a portion of the duodenum was adherent to some cicatricial tissue, which had bound down the ureter and the bloodyessels of the kidney. In dissecting the bowel free, it became necessary to cut into the ureter and leave a small area of its wall attached to the bowel. No attempt was made to close the opening in the duodenum, as it was very minute and well surrounded by scar tissue. From the fourth to the twelfth day after operation there was a discharge of duodenal contents from the incision. The patient's bladder symptoms ceased promptly after the operation, a circumstance which would seem to show that the upper intestinal contents were extremely irritating to the bladder. Davis thinks that trypsin very likely was responsible for the vesical irritability. He states that the most interesting feature of the whole case to him was the cessation of bladder symptoms on the day after the operation in a patient who had suffered from

tenesmus, pain and frequency for more than two years.

As to the pathogenesis of the condition, it seems probable that the patient had had a perinephric abscess, which ruptured into the duodenum and ureter and which was effectually drained through the openings thus made. In looking over the literature, Davis found 2 cases which, while not identical with his own, are very rare and interesting. One of these, reported by Thevenard, was that of a patient in whom a duodenal fistula developed in a persistent sinus ten years after the removal of a tuberculous kidney. Another was reported by Van Vranken in which a large abscess pointed over Poupart's ligament on the left side, and which, upon being opened, was found to communicate with the descend-

ing colon. After a month of fecal drainage from the cavity, urine also began to escape. After a number of weeks it stopped and the fistula closed. The ultimate outcome of this case is not known, the patient being lost sight of after six months. Davis states that this latter case was the only one he could find which he considers analogous to the case

which he has reported.

The practical lesson to be drawn from this case is that the duodenum should be isolated and protected before clamps are applied to a mass of inflammatory tissue around the pedicle of the right kidney. While the accident of including or even injuring the duodenum is not very common in the hands of skilled operators, the possibility of its occurrence should always be borne in mind. I believe it to be good surgery always to plainly see the elements of the renal pedicle before applying clamps or ligatures.

DISEASES OF THE BLADDER.

C. H. Mayo¹² discusses the cases of this malformation which have come under his observation since 1896. Of this number there were 15 in which, for various reasons, operation was not done at the time of the examination. In 6 cases the plastic closure method was done. It was not considered satisfactory, however, and its use was abandoned. The Maydl operation was done three times, two of the patients dying of uremia shortly after the operation. In 13 cases transplantation of the ureters into the bowel was practised, this being the operation which the author favors, for, according to his experience, it has controlled the urine and has not been followed by any untoward results. The children so operated upon have been able to attend school, and the older ones are now able to work and earn their own living. One patient is mentioned who completed a course in a Nurses' Training School. One out of the 13 operated upon by this method died from pneumonia shortly after leaving the hospital, one died three years after the operation from tuberculosis of the lungs, and another three years after the operation from typhoid fever.

The method which Mayo employs is essentially that recommended by R. C. Coffey some years ago, and which was originally devised for the treatment of obstruction of the common bile duct by transplanting it into the duodenum. Mayo describes his technic practically as follows: A low lateral abdominal incision is made on the right side and the ureter exposed by opening the posterior parietal peritoneum, after which it is isolated to within an inch or an inch and a half of the bladder, at which point it is divided and the distal end ligated. It is completely freed from its bed for a distance of two and one-half to three inches.

The posterior peritoneal incision is closed up to the site at which each ureter emerges, and the lower end of the latter structure is split for a quarter of an inch. Then a curved needle threaded with chromic catgut is passed through this end, the suture tied and its short end cut off. The sigmoid is caught in a large curved forceps and incised longi-

tudinally for a distance of one and a quarter or one and a half inches down to the mucous membrane. The membrane is then punctured and the curved needle holding the catgut, which was previously passed

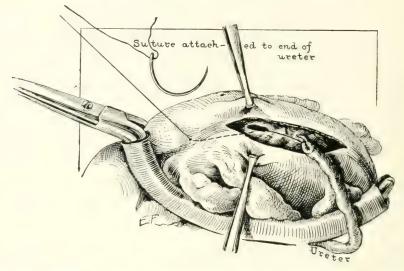


Fig. 4.—Ureter ready to be drawn through incision into lumen of bowel. (Mayo.)

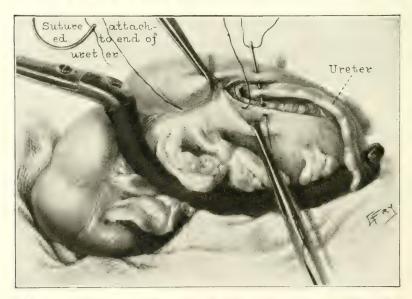


Fig. 5.—Infolded ureter in large bowel similar to gastrostomy. (Mayo.)

through the slit end of the ureter, is passed into the lumen of the intestine through the puncture and brought out of the bowel one-half inch farther down. Traction upon the catgut suture draws the end of the ureter into the bowel. One stitch is then taken through the peritoneum and muscular layer in order to fix the ureter within the wall of the intestine. Then the sides of the incision in the outer walls of the gut are sewn over the ureter, the stitch including the superficial tissues of the latter structure. Another row of peritoneal sutures is finally inserted, the last ones going down over the knot which fixes the ureter in place. Thus a natural duct entrance is formed, so that even the slightest pressure from within the bowel closes the duct, though not sufficiently to prevent the escape of urine by the ureteral contractions. The intestine is fastened to the posterior parietal peritoneum in order to close off the ureteral entrance. The operation is done on one side at a time, the author making the transplant on the right side first and doing the left about two weeks later. Within a few days the urine will be passed at frequent intervals. Sometimes a small tube has been inserted into the rectum and allowed to remain for a few days so as to drain away the urine.

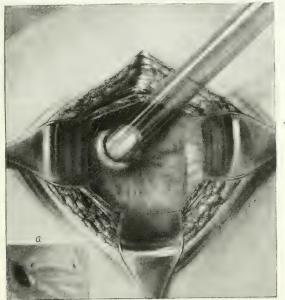


Fig. 6

Diverticula. Young¹³ describes a new method for operating upon vesical diverticula, which consists in invaginating the wall into a glass tube, after which it is turned completely inside out and excised. If necessary, the opening of the diverticulum may be dilated with forceps to admit the tube. When the tube has been passed to the bottom of the diverticulum, suction is made by means of an electric air pump. Young states that as soon as the suction is begun, the mucous membrane will be drawn into the orifice of the tube. As soon as this occurs, the tube is carefully drawn out a short distance, the suction being continued until the lining of the diverticulum comes well up within its lumen.

¹³ Surg., Gynec. and Obst., February, 1918.

It is stated that the mucous membrane not uncommonly will be drawn into the tube for a distance of one and one-half to two inches. The tube

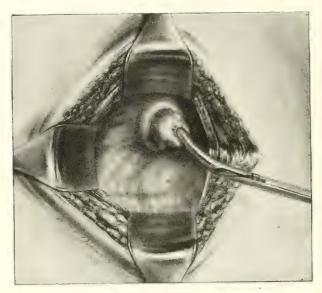


Fig. 7



Fig. 8

is slowly drawn out, carrying the wall of the diverticulum with it. As soon as it has passed beyond the opening of the diverticulum, the mucous membrane is picked up with a toothed clamp, then the glass tube is removed, and the delivery of the diverticulum is completed by making traction upon it with another forceps which grasps it around its base. If necessary, the orifice may be again dilated. When complete delivery has been effected, the neck of the diverticulum is incised and the mucous membrane dissected up at one place. Then by blunt dissection with gauze, it is entirely separated and removed. Only the mucosa and submucosa are treated in this manner. If the ureter is exposed in this dissection, it is pushed back. A cigarette drain is carried out extra-vesically and lateral to the bladder until it reaches the collapsed cavity from which the diverticulum has been removed. The incision in the bladder is then closed around a rubber drainage tube, or sewn up completely, in which case a retention catheter is passed through the urethra.

Tumors. In last year's review the treatment of vesical neoplasms by radium was mentioned, the work of Young and Barringer being cited. During the present year several other contributions to the subject have been made, notable among them being one by Henry Schmitz, 14 of Chicago. In discussing radium therapy, this author calls attention to the necessity of using only the deeply penetrating gamma rays of radium in order to destroy the vegetative function of the epithelium without destroying or inhibiting its nutritional function. Under the action of these rays, carcinoma cells degenerate and eventually are rendered harmless. Furthermore, irridation produces a swelling, and finally an occlusion, of the endothelium lining the capillaries, the effect of which is to cut off some of the blood supply of the tumor.

The action of radium upon hemorrhage is very gratifying, according to Schmitz, who states that, used in combination with the filtered Roentgen rays, it will almost always stop the bleeding. Pain likewise is favorably influenced, relief being obtained in about 30 per cent. of cases. Cystitis and pyuria have also yielded in approximately 60 per cent. of cases.

In operable cases, that is, in those in which the neoplasm is localized in the bladder, the author expresses the opinion that better results will be obtained by surgery if the operation be preceded and followed by irradiation. Consequently, he subjects the tumor, together with the neighboring tissues and the anatomically related lymph nodes, to the action of the gamma rays of radium and filtered x-rays before the operation is done, and then within two or three weeks after operation he subjects the pelvis and bladder to another exposure.

In cases plainly inoperable, as well as in some which he terms the borderline class, he states that there is no method which will give such good results as this combined actinotherapy. The patients so treated have improved so much that they have been able to return to work and perform their daily duties for a considerable time. Local healing

has also been observed in such patients.

With regard to dosage, Schmitz states that the gamma rays from 25 mg, of radium will cause degeneration of all carcinomatous elements in a tumor occupying an area about 1 cm, in diameter and 1 cm, in depth in about eight hours. He bases the dosage employed and the length of exposure upon this assumption. If the tumor extends beyond the depth of 2 cm, he states that radium therapy is impracticable, for the reason that the destruction of tissue caused by long-continued exposure will offset the benefit derived from subsidence of the growth. Metastases in the lymph nodes and widespread infiltration of contiguous tissues can be treated only with heavy doses of radium, varying from 1000 to 2000 mg., or with massive doses of filtered x-rays. He believes that the latter are as beneficial as the former. By means of the cross-

fire method, the deepest parts of the pelvis can be reached.

The author does not consider the instruments especially constructed for introducing small quantities of radium into the bladder as being very practical. In view of the necessity for prolonged application and the difference in dosage required for different cases, he prefers to make the application through a suprapublic wound. In cases in which the patient does not wish to have a cystotomy, he prefers to place large amounts of radium in a soft catheter and pass it into the bladder rather than to use any of the especially constructed metal instruments designed for the purpose. The author reports 5 cases, in 3 of which the results were apparently good. In one of these, however, it was not determined whether the tumor was benign or malignant. In one in which microscopic examination proved the growth to be an epithelioma. the bladder was normal and the patient felt perfectly well nearly two years after radium treatment. In the third case, which was also malignant, the tumor had been reduced to the size of a walnut two months after treatment, and was removed by fulguration, which, in turn, was followed by another application of radium and x-rays. Only a short time had passed when the author reported this case, and therefore he was not able to make any positive statement concerning the ultimate result. Three other cases of carcinoma of the bladder, secondary to uterine carcinoma for which panhysterectomy had been performed, were also treated, but the results were very discouraging, all the patients dying within a few months. They seemed to improve for a few weeks, but extensive recurrence then took place to which they soon succumbed.

Isaac Levin, ¹⁵ of New York, also speaks favorably of the palliative results obtained in carcinoma of the bladder by radium therapy. He agrees with Schmitz that the best way of applying it is through a suprapubic opening. He also recommends its simultaneous application to the rectum by which means a cross-fire effect can be obtained.

Two favorable results have also been reported by Burrows. One was that of a man aged fifty-five years, who had been troubled at intervals for at least five years with hematuria, pain and difficult micturition. Two years before he came under the author's care a tumor had been removed from his bladder, after which he remained well for eight

16 Radium, May, 1917.

⁴⁵ Urolog, and Cutan. Rev., January, 1918.

months, but at the expiration of that time the hemorrhage recurred. In February, 1914, his bladder was again opened and an inoperable tumor was found. Thirty millicuries of radium emanation were passed through the suprapubic opening in a screen of 1 mm. of silver and left in situ fifteen hours. The patient remained well for eight months, when slight urinary hemorrhage again occurred. Cystoscopic examination at this time showed one small nodule. Following another application of radium, made on this occasion through the urethra, and continued for twelve hours, the hemorrhage stopped, and, at the time the case was reported, it had not-returned. The patient also felt well.

Another patient, a man, aged forty-eight years, had been troubled with hematuria and pain for three years. In January, 1914, a small papillomatous growth was removed from his bladder. It was situated near the right ureteral opening. In February, 1916, an indurated tumor was partly removed through a suprapubic opening and a tube of radium placed over the site of the tumor. A few days later general irradiation of the bladder was given for twenty-four hours. The patient has been

perfectly well ever since.

A paper devoted to the technic of applying radium to vesical tumors has been contributed by Gustav Kolischer,¹⁷ of Chicago, who states that after trying a number of different methods he has decided that its introduction through the urethra may be satisfactorily carried out by means of a silver sound, having on its tip a hollow gold capsule into which the radioactive substance is placed. This capsule is fastened to the sound by means of fine screws. The size of this instrument is 18° F, and the thickness of the gold capsule is only 1 mm. It holds 100 mg, of mesothorium. In case radium itself is used, a somewhat larger capsule will be required. The author states that very little difficulty has been experienced by the patients who have had this instrument left in situ for several hours. The majority of them can urinate alongside the instrument, but it may be removed and replaced again if they are unable to void when it is in the urethra. For the female bladder a straight sound constructed upon similar principles is employed.

When the radioactive substance is introduced through a suprapuble opening, the author states that the type of carrier employed should vary with the characteristics of the tumor. Thus, if a growth on the trigone, which has been flattened out by previous diathermy, is to be treated, a simple filtering capsule may be used, and the same will suffice also for treating an infiltration in the base of the bladder. If there be an excoriated ulcer, a filtering capsule attached to a rigid stem will be found convenient, the stem being fitted with a cross bar perforated at regular intervals. The cross bar is movable and may be fixed at any point by means of two small screws. After the capsule is placed in the bladder and the cross bar is fixed, the latter is attached to the abdomen by means of tubes running through opposite holes in the bar. If a carcinomatous suprapubic sinus is to be treated, the carrier is placed in a cannula and the shield of the cannula is used for the desired fixation. To obtain a

¹⁷ Urolog. and Cutan. Rev., January, 1918.

cross-fire effect, the capsule-bearing sound is introduced through the urethra and one of the outside carriers is placed over the suprapubic region. For use in the rectum, a filtering capsule protected with heavy lead caps is employed, the caps being fenestrated in such a way that

the rays are directed only against certain areas.

At a recent meeting of the New York Academy of Medicine, Barringer¹⁸ made a further report upon the use of radium. He states that if surgery could cure 15 cases in 100, he believes that radium could cure 20 cases. He has now treated 43 cases. Two of the number were operable and some of the remaining 41 might have been considered so by certain surgeons. The operation required would have been a partial or complete cystectomy, and, on the whole, would have presented a slight chance of cure. One patient has been free from symptoms and also from signs of recurrence for twenty-three months, one for twelve months, one for six months and one for seven months. In one recently treated, the first cystoscopic examination showed no signs of a malignant condition. In 2 cases recurrence has taken place. There are 3 other cases in the series which Barringer believes will be placed in the "cured" column later.

In commenting upon this form of therapy I wish to call attention that its application should be attempted only by those who have been especially trained in radiotherapeutic methods, and who, consequently, are familiar with their underlying principles, as well as with all the technical details of treatment. Surely, the best results cannot be obtained by merely placing a tube of radium against a malignant growth without any regard to the quantity employed, the length of time the application should be continued, and the time at which a second application may be indicated. It seems not improbable that insufficient dosage may cause increased proliferation of cancer cells; and, furthermore, an application of too great intensity, or one continued too long, might so destroy the vitality of healthy tissue as to cause a perforation, or to open a large bloodvessel and thereby give rise to a severe and possibly fatal hemorrhage.

Syphilis of the Bladder. H. A. Fowler, 18 of Washington, makes an interesting resumé of this rare condition, reporting 1 case from his own hospital service and analyzing a number which he has been able to collect from the literature. He quotes Proksch, who, in 1879, was able to find only 6 cases which could be considered authentic. At that time no clinical diagnosis of the condition had been made, the observations having been derived from evidence found at autopsy upon subjects known to be syphilitic. Ulcers, deep infiltrations, tumor-like masses and perforations were considered syphilitic in origin. Upon careful analysis of such cases, however, the small number above mentioned were the only ones which Proksch thought could rightly be considered specific.

Rare cases were reported in which vesical symptoms disappeared under the influence of antisyphilitic treatment, consequently it was assumed that the underlying cause was specific. In 1900, Natzenauer published

Internat. Jour. of Surg., July, 1918.
 Jour. Am. Med. Assn., October 27, 1917.

the first report of a case in which a diagnosis of tertiary syphilis of the bladder had been made as the result of a cystoscopic examination. Not until 1909, however, according to Fowler's investigations, was it shown that the bladder may be affected in secondary syphilis. He quotes Levy Bing to the effect that in this stage of the disease the bladder is affected with an erythema much like the roseolous skin lesions, and that superficial ulcerations likewise not uncommonly may be detected.

The author has been able to find 9 cases of secondary syphilis of the bladder, one case being that of a child aged four years, who was infected by its nurse. Autopsy showed extensive ulcerations of the mucous membranes, including that lining the bladder and urethra. In all of these cases there were associated lesions in other parts of the body. With regard to the nature of the vesical lesions, it may be stated that macules, papules and ulcerations have all been found. The ulcerations are usually multiple, varying in number from 2 to 12, and being superficial with a slightly elevated edge. In shape, they are either round or oval. While most commonly found near the ureteral openings, they may occur in any part of the bladder. The symptoms naturally vary with the character, size, and location of the lesion. When there are ulcers near the vesical outlet, cystitis of varying degree will be present. The pain is not influenced by rest. It may be referred to the suprapubic region and to the perineum, may radiate to the lumbar region, extend along the urethra or be referred to the rectum. The urine may be clear, though it is often blood-stained, and, if secondary infection should take place,

it would, of course, become cloudy.

Tertiary lesions are much more common than secondary lesions. Gummata, being of slow growth, produce very little disturbance at first, but as they encroach more and more upon the mucous membrane they give rise to hemorrhage, which often comes on without warning and is very profuse, these characteristics being due to the erosion and opening of vessels. In fact, hematuria is stated to be the most pathognomonic, as well as the most constant, sign of tertiary vesical syphilis. As in vesical tumors, pain is not a constant symptom and varies considerably in intensity. Thus in some cases it may be sharp and continuous, whereas in others it amounts to little more than a feeling of discomfort. Increased frequency of micturition is a fairly constant symptom and is usually progressive. It is in well-developed cases that subjective symptoms are the most pronounced. When the bladder is examined through the cystoscope, the lesions can be readily detected. Usually they will be seen to be gummatous ulcerations, although discreet papillomatous growths are sometimes found. Fowler states that both forms may be present in the same patient. The ulcerations are usually multiple, the largest being about one and a half to two centimeters in diameter. They occupy a portion of the gumma, and thus usually arise somewhat above the level of the normal bladder wall. Their margins are irregular, their base necrotic and of a gravish color. The necrotic material may become detached in places, thus leaving a red, nodular surface. The surrounding mucous membrane is edematous, the vessels injected and prominent.

Some cases of sclerogumma of the bladder and prostatic urethra were found by the author. The tissues were much indurated and occupied a higher level than the healthy parts, the surface being reddened and showing a number of fissures, together with a few minute ulcerations. It will be readily understood that the tertiary lesions involve the deeper parts of the bladder, and that they may cause a perforation. Fowler states that a loop of bowel may become adherent to the diseased area and thus a vesico-intestinal fistula be formed if ulceration takes place.

This form of syphilis seems to respond very quickly to treatment as is shown by the rapid subsidence of symptoms and the gradual healing of the bladder lesions. The ordinary measures employed in treating cystitis, however, have no influence whatever, either upon the subjective or objective symptoms. Immediately after the administration of salvarsan, or within a short time after the institution of proper mercurial treatment, a profuse and rebellious hematuria will often subside. Vesical irritability is likewise promptly relieved. Healing of the vesical

lesion can be watched by means of the cystoscope.

Fowler's patient was a boy, aged nineteen years, who complained of frequent and painful micturition and who passed some blood in the urine. There was no history of venereal disease. Enlargement of the inguinal, trochlear and axillary lymph nodes suggested the possibility of syphilis, inasmuch as there was no other cause apparent. Blood examination gave a strong positive Wassermann reaction. Cystoscopy showed a generalized cystitis, and just external to the right ureteral orifice a small ulcer was detected. It was about one centimeter in diameter and had an irregular outline and inflamed base. No other ulcerations could be seen. The appearance of this ulcer suggested tuberculosis, but no tubercles could be found in the bladder and the urine remained negative to tubercle bacilli after repeated examinations. In view of these findings, it was deemed advisable to administer salvarsan. Within twenty-four hours after the first dose had been given there was improvement in the urinary symptoms, and at the end of a week the patient was able to retain his urine for three hours and experienced very little pain upon voiding. Another injection of salvarsan was given, after which mercury was administered by mouth. Three weeks later cystoscopy showed great improvement in the appearance of the bladder, the ulcer having completely healed. The patient felt so well that he insisted he was cured and left for home. His urine, however, was turbid and contained bacteria, and there were some discreet patches of inflammation scattered over his vesical mucosa.

An interesting case has been reported by Fred H. Cole,²⁰ of Detroit, Michigan. It was that of a woman, aged thirty-four years, who contracted syphilis twelve years before. She had received treatment, and for six years there had been no signs of recrudescence of her infection. Vesical symptoms first manifested themselves in 1907, and had persisted up to the time the author saw her in 1913. They consisted of pain and frequency and at one time an attack of acute retention asso-

²⁰ Urolog. and Cutan. Rev., August, 1918.

ciated with the passage of blood. Acute exacerbations occurred every four or five weeks, the patient passing blood and being obliged to urinate every two or three hours. The patient had also had gonorrhea, and it seemed possible that her vesical symptoms might be due to the latter infection. Blood examination showed a positive Wassermann plus two. There were no clinical signs of syphilis. A culture of colon bacilli was obtained from the urine, and tissue passed from the bladder showed mucus, fibrin, many red and white blood cells, and bacteria. No definite new tissue formation was observed. Only slight improvement followed the use of vesical irrigation and the administration of autogenous vaccines. After three months of this treatment a cystoscopic examination was made and it was found that, in addition to a marked trigonitis, there was a large, crescent-shaped ulcer near the right ureteral orifice, its base necrotic and covered with pus and fibrin. There was also a small indurated ulcer near the left ureteral orifice. These ulcers were fulgurated twice and improved somewhat in appearance. It was then suspected that these lesions might be syphilitic and it was decided to try the effect of salvarsan. After two injections had been given there was a marked improvement in the vesical symptoms. In three months after the first injection cystoscopy showed the larger ulcer healed, a white scar occupying its place. No trace of the smaller ulcer could be found. The patient has been kept under observation for three years and has not suffered from any recurrence of the bladder trouble.

Gunshot Wounds of the Bladder. Cathelin²¹ contributes an interesting paper on this subject based upon 29 cases which have come under his personal observation. As regards the frequency of their occurrence, he states that they seem to hold a middle place between injuries of the kidney and injuries of the penile urethra, and that they are to be considered rather as a variety of intrapelvic injury than a traumatism inflicted through the anterior parietes, which seriously involves the soft parts in front of the bladder. Bladder injuries of the latter type he has found to be rare in comparison with those which occur through the posterior parts of the body, such as the lower part of the pelvis and the buttocks. Thus, in this series there were 16 in which the missile entered through the gluteal region, and 4 in which it traversed a lateral path, in contradistinction to 7 in which the route was pubic or suprapubic. The trajectory in the two remaining cases is not stated.

Among the author's cases were some in which the injury resulted from a simple passage of a bullet, a piece of shell, or other foreign body through the bladder without any portion being deposited therein. In others a fragment was left within the bladder, although in a certain proportion of this number it did not immediately give rise to symptoms, so that its presence was detected a considerable time after the infliction of the injury. There were also a certain number of cases in which neighboring organs were injured, and some in which there were persistent suprapuble fistule. Finally, in a small percentage of cases the patients suffered from certain urinary disturbances, which were considered func-

²¹ Lyon Chirurgical, January and February, 1918.

tional because there was not sufficient objective evidence to account for their occurrence.

In 5 of the author's cases the rectum was injured, and in 3 there was an associated fracture of the pelvis. Urine was discharged through the wound in 17 cases. In 7 cases there was retention, and, in 5, signs of cystitis were present at the time the patients came under observation. Blood was passed in 11 cases, in 2 the quantity being so large as to give rise to alarming symptoms. In addition to bullets and fragments of shells, pieces of bone and calculi were found, the latter probably being formed around particles of wire or bits of clothing that had been blown into the interior of the bladder.

The author expresses the opinion that foreign bodies do not require immediate removal, so that the patients can be transferred to base hospitals where facilities for operating are better than upon the field. Immediate operation is advised in cases in which there is much bleeding, in those in which the rectum has been simultaneously injured, and in those complicated by peritonitis when first seen.

Great stress is placed upon the desirability of having every soldier empty his bladder immediately before he goes into action, for by this means the author believes that the frequency of its injury will be greatly lessened. He states that he has seen many paravesical injuries which at first sight might easily have been mistaken for injuries of the bladder, and which unquestionably would have been such if the injury had been received when the bladder was distended. There were 3 deaths in this series of cases.

This subject was also discussed at the last meeting of the Urological Chiefs of the French Army who, after listening to and discussing extensive reports made by Chevassu and Escat, adopted the following views:

1. Wounds of the bladder caused by firearms are of considerable immediate gravity, a circumstance due in large part to simultaneous injury of the peritoneum or intestine.

2. The ideal treatment of wounds of the bladder by suture can only be realized in exceptional instances. Generally, the results are not as good as one might expect.

3. Wounds which involve the interior of the bladder are to be considered under two classes, viz., those in which the patients have been subjected to cystostomy, and those in which they have not.

4. Immediate cystostomy appears to be the best routine measure that can be adopted.

5. Derivation of the intestinal contents by an artificial anus in cases of vesico-intestinal fistula seems to be useless in the majority of cases. Its indications are very limited.

6. Patients who have had a cystostomy performed should be sent to the urologic centers as soon as possible, provided they are not suffering from associated injuries which would contraindicate moving them such a distance.

7. All patients who have been sent to general hospitals in the interior should also be referred to special urological hospitals at once.

Gangrene Caused by Anaërobic Bacilli. The condition known as vesical gangrene, in which large sloughs are formed and sometimes expelled, particularly in the female, has been occasionally described by different writers. Recently a contribution to this subject has been made by Legueu.²² of Paris. He reports 2 cases and discusses the etiology and bacteriology of the affection as well as its symptoms and prognosis. The first case that came under Legueu's observation was that of a young soldier who had been wounded twenty-four days previously, and who had been successively transferred from a first aid station to a base hospital and thence to an auxiliary hospital in Paris, before he was finally sent to the genito-urinary service at Necker. He had been operated upon for the removal of pieces of shrapnel from the buttocks and thigh, and two days after the operation had developed an attack of retention of urine. An attempt to catheterize him resulted in the formation of a false passage. The bladder was not emptied through the instrument, so that the patient evidently had developed the incontinence of retention, as he discharged some urine through the urethra. During the following days variable quantities of urine had been withdrawn by means of instruments introduced at short intervals. As a result of these manipulations, the author believes that the bladder was infected.

The patient was admitted to Necker on the night of July 26, At that time a metallic instrument was in the bladder. Its eye was obliterated by urinary salts. This instrument was removed by the nurse. The patient complained of a great deal of pain in the abdomen. The next morning a large dressing, which was held in place by a double spica bandage, had become thoroughly saturated with urine, which escaped from the urethra drop by drop. Upon palpation, the bladder was found to extend above the umbilicus; the slightest touch produced severe pain. The urine was very cloudy and malodorous. The nurse succeeded in passing a catheter into the bladder and withdrawing a large quantity of purulent urine, which was followed by an escape of thick, fetid pus. The catheter was left in place, but despite a prolonged irrigation the liquid would not return clear. This irrigation was repeated in the afternoon, when it was found it did not return easily despite various manipulations of the catheter. The following day, July 28, the catheter was blocked so that no urine came out through it, although enough had escaped alongside it to saturate the The instrument was removed and another one inserted. through which several small irrigations were given. The patient's general condition was very bad and he suffered excruciating pain, so that it was decided to open his bladder through a suprapubic incision. This was done by one of Legueu's assistants who, as he was about to fix the margins of the vesical wound to the abdominal walls, noticed something which he at first mistook for gangrenous omentum. He immediately suspected that there had been a rupture of the bladder, which had permitted the omentum to pass down into its cavity. As he made traction upon the mass of tissue which presented at the margins of the wound,

²² Jour. d'Urol., March, 1918.

in order to free it and put a ligature around it before cutting it away, he saw that it was becoming detached from the bladder wall. Further traction accomplished its complete delivery. Digital exploration of the vesical cavity showed that there was no perforation in its walls, which, however, were thick and hard. A thorough irrigation with oxycyanide of mercury solution was given, after which a large tube was put into the wound. Vesical irrigations were carried out through this tube for a number of days, but the urine continued to be purulent and very malodorous. By August 20 it was deemed advisable to institute drainage through the urethra as the bladder had contracted and the urine had become clear. After a few days the suprapubic fistula closed.

Upon examination, the mass of tissue which had been removed from the bladder during the operation was found to be a large sac, which apparently had sloughed away from the greater part of the internal surface of the bladder. Internally, it seemed to be made up of the entire thickness of the vesical mucosa, and on its external surface to contain some of the muscular coat. In consistency it was much like cellular tissue which has macerated for a long time in liquid. On its internal surface there was no sign of anything resembling a ureteral orifice, so it

seemed probable that the trigonum had remained intact.

A bacteriological examination of the urine was made a short time after the operation. Three aërobic microörganisms were found: The micrococcus ureæ, a staphylococcus albus, and a small white gram-positive bacillus, which proved to be non-pathogenic for mice and guinea-pigs. The anaërobic cultures remained sterile for a number of days, after which, in one tube, a few colonies of a peculiar looking bacillus developed, which was identified by Dr. Salimbeni of the Pasteur Institute, as an organism first described by Jungano under the name of bacille neigeux, which may be translated as snow-flake bacillus.

Jungano²³ has carefully described this microörganism, and it is deemed advisable to quote from his work here in view of the possibility of some of our military men having occasion to study and treat cases which may be caused by it. Some American bacteriologists with whom I have spoken are not familiar with this organism. It resembles the bacillus perfringens. It has slightly rounded extremities, is immovable, and stains with all the aniline dyes as well as with Gram's solution. Upon agar-agar it begins to grow in the form of minute white spots within eight or ten hours after the culture has been incubated. These little colonies, examined under a low power lens, look very much like bone cells and their canalicular prolongations. Development is complete at the end of twenty-four hours. The colonies are very characteristic, being white, irregular and arborescent. They look very much like minute snowflakes, hence the name. This organism does not produce gas nor spores; it is pathognomonic to guinea-pigs and white rats; it does not develop upon gelatin, and grows very poorly in bouillon, which it renders cloudy at the end of twenty-four hours.

Legueu calls attention to the difficulty of making the diagnosis of

⁴ La flore de l'appareil urinaire normal et pathologique, Paris, 1908.

vesical gangrene. In the case above described the possibility of gangrene was considered because of the extremely fetid odor of the urine, as well as for the reason that the catheter became occluded within the bladder, but could be made permeable again by moving its tip around within the viscus. In the female the sphacelated tissue is frequently expelled, but in the male the caliber of the urethra is too small to permit its passage, particularly when it consists of an extensive cast of the bladder, such as was found in the case of the patient above reported.

Legueu quotes a number of other authors who have reported cases to show that this form of gangrene is relatively benign, as the patients all got well under simple treatment. The ultimate prognosis, however, as to function and personal comfort he considers to be bad. Incontinence due to contraction of the bladder has been a not uncommon sequel. The possibility of renal complications must also be borne in mind. In Legueu's case it was necessary to open and drain the right kidney several months after the patient had been discharged from the hospital. There was also some evidence of involvement of the other kidney in the suppurative process. Thus an ascending pyelonephritis constitutes one of the ulterior dangers, even in cases in which healing of the bladder takes place within a comparatively short time.

A second case was brought to Legueu's attention by one of his colleagues, Behr, during the time that he had the young soldier under observation. It was that of a woman, aged twenty-seven years, who developed the condition during an attack of typhoid fever. It was necessary to catheterize her, and the author believes that, as in his case, the infection was introduced from without; indeed, he states that retention of urine, which by previous authors has been considered as the cause, is to be regarded only as a circumstance in the evolution of the trouble, the real cause being due to infection introduced during catheterization. In view of the bacteriological finding in his case, he ventures the opinion that the causative organism may invariably be an anërobic bacillus. This paper of Legueu's is a very interesting one and I can heartily commend it to any who wish to study the subject more in detail.

DISEASES OF THE PROSTATE.

Hypertrophy. During the year a number of contributions have come from the Mayo Clinic. Notable among these is one by E. S. Judd,²⁴ which is devoted largely to the technic of prostatectomy. He insists that much is to be gained by attention to every operative detail and expresses the opinion that extra time spent in preventing infection in the field of operation and surrounding tissues, in controlling hemorrhages and in accurately fastening the drainage tube, will be to the patient's great advantage. His idea is plainly conveyed by a statement that the technic of the operation is more important than the time consumed in performing it.

In order to expose the field of operation, a self-retaining retractor is

²⁴ Pennsylvania Med. Jour., November, 1917.

used, by means of which the incised bladder walls are held apart and the base plainly brought into view. As soon as the bladder is opened, 0.5 per cent. of novocain is injected into the prostatic capsule, the author believing that it not only contributes to the prevention of shock, but that it also controls oozing during the operation, and, furthermore, helps to free the hypertrophied tissues from the prostatic capsule and therefore renders enucleation somewhat easier. Illustrations accompanying his paper show the prostate being separated from its capsule by means of forceps instead of the finger. All spurting vessels are ligatured. Oozing from the vesical mucosa is satisfactorily controlled by interrupted sutures, which are also made to include a portion of the prostatic capsule. Only occasionally has it been found necessary to pack with gauze. The author points out that while this oozing will usually be arrested spontaneously, it is much better to stop it before the patient leaves the table, for while he admits that the loss of a little blood may not give rise to any alarming symptoms, he contends that it may reduce the patient's resistance to infection. In those cases in which the bladder is not infected and in which it is known that the catheter is well tolerated, the wound has been completely closed and drainage secured by means of the urethral catheter. When this method can be used, the danger of infection in the prevesical space is materially reduced. When suprapuble drainage is employed, great care is taken to sew the tube inside the wound in such a manner that the urine will not escape around its sides. Of late, Dakin's solution has been used in the prevesical space for a few days following the operation, Carrel's technic being employed. While it has not been possible to form any definite conclusion as to the value of this method, the author feels confident that infection is not occurring as frequently now as it formerly occurred. Irrigation is not employed until several days after the operation. As a rule, it has been possible to do the operation in one stage, preliminary drainage having been effected by means of the urethral catheter. One objection that is brought against the two-stage operation is that contiguous tissues are exposed to infection after the wound has been reopened.

H. C. Bumpus²⁵ reports on vaccines, which were regularly used in the Clinic for a certain period since May, 1917. They were administered to all patients who came under treatment in the five months following that date and the results were compared with those obtained in the cases of all patients treated during the five preceding months. The incidence to wound infection, cystitis, pyelonephritis, phlebitis and epididymitis were studied in the two series. Of these complications, pyelonephritis was considered the best criterion and upon its occurrence in the two groups the author's judgment was formed. For a short time he was enthusiastic, but continued use of the vaccine caused his faith in it to wane, until finally, after he had studied a considerable number of cases in each of the two groups, he abandoned it. Some of his figures are interesting. Thus, in the series in which vaccine was given, there was

²⁵ Selected papers of the Mayo Clinic, 1917, vol. ix.

5 per cent. less of pyelonephritis than in the controls, but 1 per cent. more than in all cases. There was also a 10 per cent. increase in the cases of epididymitis among patients who received the vaccine. The author felt that the administration of a mixed colon vaccine does not markedly reduce the incidence of genito-urinary infection, if it affects it at all. In 1912, I had autogenous vaccines prepared from the urine of a number of prostatics and, after using them for a while, abandoned them as being absolutely worthless. I could not see that they influenced the patient's condition in any manner whatsoever. In the Mayo Clinic a mixed colon vaccine, prepared from different strains of colon bacilli isolated from different urines, and made once a week, was administered subcutaneously every three or four days. With two exceptions, no untoward symptoms resulted, the patients complaining only of a little nausea, discomfort and fever after the first few injections. Some patients did not react even to this extent. In two, however, the reaction was so severe that the treatment was discontinued.

In discussing infections in hypertrophy of the prostate, Judd²⁵ reports some interesting observations made in 5 cases in which complete data were obtained. In 4 cases the Staphylococcus albus was grown by culture before any treatment whatever had been instituted, while in the fifth the culture media were sterile at the end of four days. In 3 of these 5 cases, colon bacilli, as well as staphylococci, were demonstrated in the urine four days after preliminary treatment had been begun, while in the other 2, in which operation was performed without any preparatory treatment, a culture of colon bacilli was obtained in 1 case on the fourth day, and in the other on the fifth. In 2 cases cultures were taken from the prostate as soon as it was removed, and whereas the one from the patient who had not had any preliminary treatment was negative, the other, taken from a patient who had been catheterized for

several weeks before operation, was positive.

The function of the kidneys in all these cases was not impaired, and this circumstance leads the author to suggest that infection may take place irrespective of any renal lesions, provided that the patient's resistance is lowered or the virulence of the microörganisms is increased. The possibility of walled-off infection in the kidney, however, is recognized and is one which the author believes to be frequently operative in prostatic cases. In fact, such areas were found in the kidneys of patients either at operation or necropsy, in whom the urine had been free from pus and bacteria except at intervals; so it would seem that these foci had opened at times and discharged their contents and then had become obliterated, others forming in different parts of the kidney, with a repetition of the process of evacuation. Infection introduced from without during preliminary treatment is also recognized as a cause in some cases. This certainly would apply in those in which the patient has catheterized himself or has been catheterized during a first attack of retention by a careless or unskillful attendant. As to the route by which the microorganisms gain access to the kidney, the author is inclined to believe that a perivesical infection first occurs, extends to the lymphatics, and then is taken up by the blood current, through which it is transmitted to the kidneys.

Finally, the advisability of prostatectomy in the presense of spinal cord lesions is discussed by Judd and Braasch.²⁷ The decision to operate, or not to operate, will be determined by the relative degree of obstruction due to enlargement of the prostate and by the extent of the nerve lesion. The information obtained by cystoscopic examination is considered most valuable in the making of a differential diagnosis, trabeculation of the bladder wall, with relaxation of the sphincters, being the most characteristic condition. Sensibility is also usually lessened. From these considerations it seems proper to the authors to remove the enlarged gland in those cases in which the function of the sphincter is normal. Attention is called to the fact that, in some cases of locomotor ataxia, the portion of the cord which controls the bladder is not affected, although in many cases it is involved so early that the first symptoms of spinal lesion are referable to the bladder.

Furthermore, it is important to differentiate between true incontinence and the incontinence of overflow, the former almost invariably being due to a lesion in the cord. When caused by the latter condition, removal of the prostate would, of course, be contraindicated. The tonicity and expulsive force of the bladder is most satisfactorily determined, according to the authors, by watching the change in the amount of residual urine and the force with which the urine is expelled through the catheter. In cases in which the muscular tone is impaired, the urine flows out sluggishly, so that it may be necessary to make pressure over the bladder in order to empty the viscus. In other cases the abdominal muscles will be brought into action in expelling the last portion. The authors have never observed a total incontinence due to enlargement of the prostate. Nine patients in whom definite evidence of a cord lesion was found upon clinical examination have been submitted to prostatectomy in the Mayo Clinic. In these cases, however, it was possible to determine that their urinary symptoms were more dependent upon mechanical obstruction than upon impairment of vesical function due to loss of nerve control.

At the last meeting of the American Urological Association, Hamer,²⁸ of Indianapolis, described a device for use in connection with the Hagner bag. It is an anchor made of soft copper wire. The Hagner bag is applied in the usual manner, the tube connected with it being brought through a hole in the summit of the wire anchor after which the bag is inflated with air. Tension is made on the tube, thus bringing the bag down into the neck of the bladder with as much pressure as desired. It is held in place by a little screw clamp outside the hole in the top of the wire anchor. The wire of which the device is made is sufficiently heavy to stand any tension that may be made upon it, though it is flexible and can be molded to fit the individual case.

An interesting paper dealing with the end-results after prostatectomy

²⁸ Tr. Am. Urol. Assn., 1917, vol. xi.

²⁷ Selected papers of the Mayo Clinic, 1917, vol. ix.

has been contributed by Clarence Martin, 29 of St. Louis, who makes his analysis from 55 suprapubic operations and 55 perineal. In collecting the information upon which his paper is based, he made inquiries of the patients' family physicians, who were more fully in touch with the patients than were the surgeons who had operated upon them. The principal post-operative conditions investigated were closure of the wound; frequency of urination; control of the bladder; incidence of cystitis and pain; force of the stream; character of the urine; and the effect of the operation upon sexual power and upon the general health. With regard to closure of the wound, it was found that in 61.2 per cent. of the suprapubic cases prompt healing took place, whereas in perineal cases it occurred in only 42 per cent. Of the suprapulic cases 93.8 per cent. were healed within three months, while in the perineal cases the percentage of healing for this period was only 66. Within one year after the operation healing had taken place in all of the suprapubic cases, but in only 84 per cent. of the perineal. Moreover, in 6 per cent. of the perineal cases there was a permanent sinus, and in one a vesicorectal fistula.

Information was obtained concerning the day urination of 37 patients who had had the suprapubic operation, and of 36 who had had the perineal. In the former class, results were good in 81 per cent., fair in 13.5 per cent., and bad in 5.4 per cent.; while in the latter group they were good in 66.6 per cent., fair in 27.7 per cent., and bad in 5.5 per cent. The effect upon noctural frequency was determined by the number of times the patient had to get up to urinate, the author believing this more satisfactory than an expression of frequency in hours. Information was obtained concerning 35 suprapubic, and 38 perineal patients. In the former class, the results were good in 82.8 per cent., fair in 5.7 per cent., bad in 11.5 per cent. In the latter class, they were good in 44.7 per cent., fair in 23.7 per cent., and bad in 3.5 per cent.

In the suprapubic cases, 80.5 per cent. of the patients have full control of the bladder, and 15.2 per cent. partial control. In the perineal cases, 64 per cent. have full control, and 22 per cent. partial control. There were 4.3 per cent. of the suprapubic patients who had complete incontinence in contradistinction to 14 per cent, of the perineal patients so affected. Cystitis, of more or less severity, persisted in 35 per cent. of the suprapubic patients and in 31 per cent. of the perineal, while 21 per cent. of the patients who had been subjected to the suprapubic operation complained of pain within the region of the operative field in contradistinction to 16 per cent. of those who had been operated by the perineal route. It was possible to secure information concerning the force of the stream in 42 of the suprapulic and in 46 of the perineal cases. In the former, 22 have a stream of good force, 8 a stream fairly strong, and 12 one that is weak. In only 12 of the perineal cases is the stream strong, in 17 it is fair and in 17 weak. There were three definite reports of stricture in the 46 suprapubic cases and 10 in 43 perineal cases. This gives a percentage of 6.5 in the former, and 23.2 in the latter. The urine became clear in about an equal percentage of cases in the two groups. Information was obtained with regard to the effect of the operation upon sexual power in 33 suprapubic and 33 perineal cases. In the former, no change was experienced in 63.3 per cent.; in the latter, in 48.5 per cent. Power was diminished in the former in 27.3 per cent.; in the latter in 48.5. It was increased in suprapubic cases 9.1 per cent., and in the perineal cases in 3 per cent. As to the effect on the general health, it was good in 43 per cent. of 49 suprapubic cases; in 3, it was bad; and in 3 no change was experienced. In 36 out of 47 perineal cases, the effect was good, in 4 it was bad and in 7 there was no change.

There are several interesting points brought out in Martin's paper, probably the most important of which is further proof, if any is needed, that the suprapubic method gives the best results in the hands of the average operator. When it is taken into consideration that some of the patients whose cases had been investigated by Martin had been operated upon by general practitioners, gynecologists, and general surgeons, as well as by genito-urinary surgeons, it is not surprising that the results obtained were not more uniform. It would be interesting to know just who had operated upon those whose condition was the least satisfactory. Greater anatomical knowledge and more skillful operative technic is required to do a good perineal operation than a good suprapubic operation, and the possibilities of injuring important structures are much greater in the former than in the latter. If the perineal operations had been performed by surgeons specially trained to do them, the results undoubtedly would have been better.

Lowsley,³⁰ in a recent paper, asserts that there is only one objection to a properly performed perineal prostatectomy, namely, that it does not easily permit the operator to examine and remove any enlarged subcervical glands. In 3 cases he was obliged to supplement the perineal operation by a suprapubic incision into the bladder in order to reach and remove the obstruction. Lowsley again points out the necessity of cleanly dividing the recto-urethralis muscle in the perineal operation in

order to protect the rectum from injury.

As the result of embryological studies, he divides the prostate into five portions, namely, the anterior, posterior, right and left lateral lobes and middle lobe. The posterior lobe, which is always present, is separated from the middle and lateral lobes by well-developed lamellæ of connective tissue in which the ejaculatory duets are imbedded. According to the author, this layer of tissue is of practical surgical importance in that it requires division before the lateral lobes can be properly enucleated. Consequently, if the lateral incisions are not made deep enough to divide this layer, the enucleating finger or instrument will be carried along its proximal surface toward the lateral capsule of the gland into a region where there are many bloodvessels, the rupture of which will cause troublesome hemorrhage. The author believes that when a suprapubic operation is done, the inter-urethral method of enucleation

is to be preferred to that carried out through incisions, as it permits removal of the sub-cervical group of glands together with the lateral

and middle lobes and is not so likely to injure the sphincter.

Recently, Ernest M. Watson³¹ has made a study of the condition of the internal sphincter in 25 patients taken at random from Young's Clinic at the Johns Hopkins Hospital, where the perineal operation is almost always considered the procedure of choice. It had been performed upon every patient in this group of 25. The study of the vesical orifice was made by means of cystograms, the bladder being filled with a 10 per cent. thorium solution and the patient then examined with the x-rays. In this manner the condition of the vesical orifice was easily demonstrated, and it was shown that in not a single case did the sphincter remain permanently The examinations were made at periods varying from three weeks to thirteen years after operation. One patient was incontinent for twenty months after the operation, at the end of which time he regained control of his bladder. A cystogram taken at this time showed the sphincter tightly closed. By examining the record of this patient, it was found that in order to remove a very adherent median lobe, the margins of the vesical orifice were grasped with clamps and the hypertrophied tissue drawn into the wound. The persistent incontinence which followed the operation was attributed to this manipulation. From his investigations, Watson concludes that incontinence following perineal prostatectomy is due to traumatism inflicted upon the muscle fibers of the membranous urethra and the intrinsic prostatic and internal sphincter muscles.

Secondary closure of the resical wound after suprapulic prostatectomy is advocated by Pauchet.³² of Amiens. A large Marion drain is put into the bladder at the conclusion of the operation and allowed to remain for nine days. On the tenth day it is replaced by a catheter, which is left in for three days. Then the suprapubic wound is sutured, a self-retaining catheter replacing the one already in the bladder. The former is left in place for a week. This method has given uniformly good results in the hands of the author, and, as it shortens convalescence a considerable length of time, he recommends its more general employment. At first he applied it only to the so-called persistent urinary fistulas, which occurred in a small percentage of his prostatectomy cases, but it was so satisfactory in the latter that he tried it early in other cases. Closure is made under local anesthesia. A lozenge-shaped area, extending at its widest part 1 cm. from the wound on either side, is outlined with the knife and carefully dissected from the underlying tissues, the bladder wall being freed for a sufficient distance, after which the vesical opening is closed by two U-shaped sutures of catgut. The latter, however, do not pass through its mucous coat. Figure-ofeight sutures are then used to close the muscles, the skin being closed

with Michel's clamps.

In this paper, Pauchet also reports his prostatectomy cases, which number 477. He remarks that it is not difficult to perform the opera-

Jour. Urol., December, 1917.
 La Presse Médicale, December 27, 1917.

tion and obtain excellent results in a considerable number of cases, but that it is not so easy to accumulate a long series of operations without encountering any difficulties or having any mortality. In his last 40 cases he has not had any deaths. The only patients he now refuses to operate upon are those in whom the condition of the heart is such as to distinctly contraindicate any operation, and those in whom the renal function is so deficient that it cannot be improved by proper preliminary treatment. He practises two-stage operations in cases in which the renal function is not improved after a reasonable time.

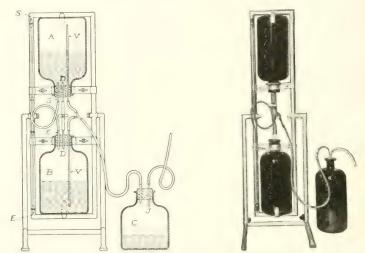


Fig. 9.—Apparatus for suction drainage of suprapubic bladder wounds. (Bethune.)

In previous reviews various apparatus has been described for draining the bladder by suction after suprapubic prostatectomy. A few months ago Charles W. Bethune, 33 of Buffalo, described another which, in his hands, has proved satisfactory. It is shown in the accompanying illustration. It consists of two one-gallon carbovs held in a frame in such a manner that their necks are opposite each other. The top bottle, A, is filled with water, to which 1 dram of carbolic acid is added, in order to prevent the formation of fungi. The fluid drops through tube D, on which is a drop clamp, into bottle B at the rate of five drops per second. Negative pressure is formed at the top of bottle A, transmitted down the tube I to the collecting bottle, C, the water in the bottom of C forming a valve and preventing the vacuum from being lost. Tube Eforms an outlet for the air in bottle B displaced by water dropping into it. A similar tube, S, forms a safety valve for A and when the negative pressure in A and C exceeds 14 inches of water, or about 1 inch of mercury, admits air into A, thus preventing too strong a vacuum. The total quantity of fluid will flow from one bottle into the other in about eight hours, and, when bottle A is emptied, the bottles are reversed by

³³ Jour. Am. Med. Assn., June 15, 1918.

turning them on the axle of the frame. A small catheter is inserted into the suprapulic wound and fastened to the skin by several strips of adhesive plaster. This is attached to a tube running down to J, so that the only suction necessary is to draw the urine from the bladder up over the level of the abdomen.

Cysts of the Prostate. A case of unilocular cyst of the prostate causing urinary obstruction has been reported by Behrend,³⁴ of Philadelphia. The patient, aged forty-two years, had suffered two years previously from a similar attack of retention which lasted four days. At that time his symptoms disappeared promptly after the use of urethral sounds. When seen by the author, he complained of a frequent desire to urinate both day and night, although he was unable to pass much urine. After a few days, absolute retention came on, so that it was necessary to catheterize him twice daily. At the expiration of ten days he became able to void, although he was unable to empty his bladder. A retention catheter could not be tolerated. Cystoscopic examination showed that the left lobe of the prostate was enlarged. No abnormalities of the bladder were detected. The bladder was opened suprapubically, whereupon it was found that the prostate presented a localized swelling on its ventral surface, which obstructed the vesical outlet. This swelling was firm and apparently solid. It was so situated and so constructed that it acted like a ball-valve. The overlying tissues were incised, and enucleation begun, whereupon it was found that the swelling was cystic. After its contents, which consisted of a turbid fluid, had been evacuated, the wall was curetted and the incision in the posterior bladder wall closed. The author states that this cyst was as large as an oxheart cherry. Suprapubic drainage was maintained for ten days. After the drainage tube was removed, the patient began to pass urine through the urethra and made a good recovery.

Because of the rarity of the condition, this case seems well worth reporting. Behrend, who has investigated its incidence carefully, states that the first clinical case which he was able to find in literature was that recorded in 1900, by Abbe, the symptoms being practically the same as those of which his own patient complained. He also mentions another case found at autopsy in 1896. He states that at that time the only cases of prostatic cysts on record were those reported by English, all of which had occurred in the newborn. The author remarks that the peculiarity of the symptoms in Abbe's case and his own is that the retention came on suddenly rather than gradually, the natural supposition being that gradual filling of the cyst would give rise to symptoms a considerable time before complete retention had occurred.

Prostatic Calculi. Seven cases of this condition have been reported by Herman L. Kretschmer,³⁰ of Chicago, who has also made a thorough study of the literature and has summarized the result of his findings. He has collated 165 cases exclusive of those which he has reported, a fact which shows that the condition is not so rare as it has generally been thought to be. The author expresses the belief that there are

35 Ibid., January, 1918.

³⁴ Surg., Gynec. and Obst., December, 1917.

many patients suffering from prostatic calculi who do not obtain relief for the reason that the possibility of the presence of calculi is not

thought of.

The different theories of formation of these stones are discussed, but, as they are all theoretical, they will not be mentioned here. As regards symptoms, Kretschmer found it convenient to divide the cases into three groups. In one the calculi do not give rise to any symptoms, so that their presence is detected in only a more or less accidental manner during examinations for other conditions. For example, in one of the author's cases, the patient had bladder symptoms caused by cerebrospinal syphilis, evidence of the prostatic calculus being found during an x-ray examination.

In the second class are placed those cases in which the calculi are associated with hypertrophy of the prostate and are found only when the gland has been removed. In this group the calculus may be within the substance of the gland, or may be situated between the gland and

its capsule.

In the third class the calculi are responsible for the symptoms which lead the patient to seek treatment. In this category naturally come the cases which are generally referred to as cases of prostatic calculus. The most important symptoms are pain, the passage of the calculus, and abscess, which may or may not result in fistula. With regard to pain, it may be stated that it is a well-nigh universal symptom, although it may not be constantly present. It may be localized in the prostate or may be referred to the perineum, suprapubic region or external genitals, and occasionally it may be reflected down the thighs. The perineal pain may at times be acute and severe, at others dull, or consist merely of a feeling of heaviness. It may be aggravated by the sitting posture.

It is not very often that the calculi are passed through the urethra, although 11 instances of this kind were collected by the author. In one case, that of Stoecker, nearly one hundred stones were passed, and in another, that reported by Santesson, the number was 22. One of Kretschmer's patients had passed calculi at intervals for many years. Abscess formation is very rare. In a few cases the stones have been

removed through fistulous tracts.

Urinary disturbances dominate the symptom-complex. Thus, in 28 cases undue frequency, either alone or complicated by other symptoms, was present. In 16 cases painful urination was noted. Difficult urination was present in 17, and dribbling in 5. Pain upon voiding, difficulty in starting the stream, incontinence and tenesmus likewise are common symptoms. Hematuria, retention and residual urine have all been mentioned in reports of cases. In 27 cases there was either complete or partial retention; in the latter condition the patient was obliged to resort to the use of the catheter at times in order to empty his bladder. Sexual disturbances are not very common, although in a few of the cases they were well-pronounced. Rectal symptoms consist of tenesmus and pain.

The question of recurrence was carefully investigated, with the result that it was found in only 3 cases, one of them being from the author's

own series. The x-ray is the one infallible means of diagnosis. Its use is also recommended after removal of the calculi in order to make sure that none have been left. Rectal examination is also helpful. Except in those cases in which there is an associated hypertrophy of the prosstate, the author recommends that the calculi be removed through a perineal incision.

A case in which some encysted stone fragments were removed through the urethroscope has been reported by Frank M. Denslow,³⁶ of Kansas City, Mo. The patient was a man, aged thirty-nine years, who fifteen years before had sustained an injury to his back, which was followed by complete retention of urine so that it became necessary to catheterize him for eight months. He gradually recovered from this trouble, although there was never complete restoration of function. At the time he came under Denslow's observation he had partial control of the bladder, except at night. The urine was purulent and contained colon bacilli. A diagnosis of impaired innervation of the bladder and colon bacillus cystitis was made. An x-ray examination of the sacral region was made to determine if there was any likelihood of surgical intervention proving of benefit. Although nothing of importance was revealed in the sacral region, it was found that some calculi were imbedded in the anterior lobe of the prostate. Urethroscopic examination showed what the author terms an "outcropping" in the roof of the prostatic urethra. From the x-ray picture it appeared that there was a single, branched stone present, so a suprapubic operation was done for its removal. Three stones, however, were found, all of which were removed. The patient made a good recovery, but his symptoms were not completely relieved. Another urethroscopic examination showed two small nearly buried fragments in the sulcus to the right of the verumontanum in the floor of the prostatic urethra. They were removed with cystoscopic forceps. Some difficulty was experienced in this procedure. After the removal of these calculi, the irritation subsided and the urine became clearer.

A prostatic calculus weighing 60 grams, which did not produce any symptoms of urinary obstruction, was removed by G. Frank Lydston,³⁷ of Chicago. The patient, aged forty-five years, had had several attacks of gonorrhea which were followed by stricture. The symptoms for which he first consulted the author improved under dilatation, massage and instillations. Some time later, however, he came back for treatment, complaining of slight vesical irritation. Examination showed that there was no obstruction in the ureter, but, upon examination of the prostate through the rectum, a large, hard mass was felt in the median line corresponding to the position of the prostate. It was definitely circumscribed and was unyielding to touch, so that Lydston at once diagnosticated it as osseous or calculous. The normal tissues had been so encroached upon by this tumor that they were easily perforated by the finger-nail, with the result that it was recognized as a stone. Operation was advised, but refused. Several months later an abscess

³⁶ Urol. and Cutan. Rev., August, 1918.³⁷ Am. Jour. Clin. Med., April, 1918.

formed in the right groin and was evacuated by the patient's family physician. Shortly afterward pus formed in the perineum and was also liberated by incision. In this abscess the enlarged calculus was found and was removed, though not without the infliction of considerable damage upon the tissues. The patient was again referred to Lydston, who, by a plastic operation, was fortunate enough to close a large median fistula in the perineum through which the feces and urine had been

discharged.

Pseudo Prostatism of Alcoholic Origin. Under this title Leon Chevenot, as of Lyons, describes a class of cases in which the chief symptoms resemble those caused by the atrophic prostate or sclerosis at the vesical neck. They are also somewhat similar to those produced by changes in the musculature of the bladder. This condition is, as a rule, observed in men who are younger than those subject to hypertrophy of the prostate. It comes on in those who habitually consume large quantities of alcoholic beverages and who consequently are the subjects of a slow and long-continued intoxication. In addition to presenting the usual symptoms of chronic alcoholism, such as tremor, gastric disturbance, and nervous irritability, they suffer from disturbances of micturition, such as difficulty in voiding, feebleness of the stream, and inability completely to empty the bladder, the last portion of urine being forced out only after considerable straining. They also have to rise two or three times at night to urinate. The bladder often becomes dilated. Upon cystoscopic examination it is found that the prostate does not show any abnormalities which would obstruct the passage of urine, nor is any change detectable upon rectal examination, unless it be that the prostate seems smaller and harder than normal. Thus, cystoscopy is considered the most valuable diagnostic means. Usually these patients show a general muscular enfeeblement, of which the vesical atony is considered a part. The author believes that, as the result of the action of alcohol upon the nerves, the sensibility of the bladder is lessened, so that the stimulus to void must be greater than in normal individuals. Thus the desire to pass urine is retarded and a larger quantity is allowed to accumulate before the bladder is emptied. He also attributes some of the changes directly to the effect of alcohol upon the bloodyessels.

With regard to treatment, the first thing to do is to suppress the alcohol and place the patient upon a mild diet of milk and vegetables. Repeated catheterizations are practised, and the patient is also urged to attempt to urinate as soon as he feels the slightest desire to do so. The bladder is also stimulated by irrigation with fairly strong solutions of silver nitrate, varying from 1 to 1000 to 1 to 300. Strychnine and faradic electricity have been disappointing in the author's cases. In some cases continuous catheterization has been required. In those badly infected, cystostomy has been resorted to, and the author mentions 3 cases in which Rochet, his surgical colleague, invaginated the anterior and superior surface of the bladder, with favorable results.

³⁸ Urol. and Cutan. Rev., March, 1918.

DISEASES OF THE EXTERNAL GENITAL ORGANS AND THE URETHRA.

Chancroid. A comprehensive and valuable paper on this form of venereal disease, in which special attention is given to prophylaxis and treatment, has been written by two French military surgeons, Majors Jambon and Tzanck,³⁹ who state that while it was comparatively rare during the first year of the war, it has been constantly increasing ever since. In their last series of statistics the number of patients confined to hospitals on account of chancroid was greater than the number confined because of gonorrhea. In their service at Caen, during the month of October, 1917, the number of days of hospitalization for chancroid and its complications was 525 out of a total of 1839. In view of this increase among soldiers, surprising as it may seem at first sight, it is deemed advisable to quote liberally from the authors' paper with the hope that their views and the reviewer's comments may prove of use to our

American military surgeons.

The authors believe that there is room for improvement in prophylaxis and treatment. With regard to the former, they call attention to the facility with which the carriers of infection can be identified, the nature of the lesions usually being apparent upon even a superficial examination. They compare the condition of the carriers of this form of contagion with that of those who disseminate gonorrhea, and point out that, while it is difficult, and sometimes even impossible, to distinguish between an infective and a simple leucorrheal discharge, it is always easy to detect the presence of a chancroidal infection. Furthermore, according to their experience, the number of persons who disseminate chancroid is relatively small, it having frequently been found that a large number of soldiers had been infected by a very small number of women. Therefore strict measures for the isolation of all infected persons are insisted upon, and some regret is expressed that the civil authorities have not always cooperated with military men as vigorously as they might in bringing about the isolation of infected persons. Concerning personal prophylaxis, stress is placed upon a fact which is already wellknown to genito-urinary surgeons, namely, that simple cleanliness will suffice, in the majority of cases, to prevent infection; thus a liberal use of soap and water after a suspicious intercourse is considered very efficacious. The application of simple ointments is also advised before intercourse. The authors consider it very unfortunate that soldiers do not fear this form of venereal disease as much as they fear gonorrhea and syphilis.

With regard to treatment, the opinion is expressed that the duration of chancroidal infection can be appreciably reduced by the intelligent application of therapeutic measures. First of all, those military surgeons who have not had much experience with venereal diseases should lose no opportunity thoroughly to familiarize themselves with the clinical characteristics of chancroid. They should also learn the different

³⁹ Annales des maladies veneriennes, March, 1918.

methods of treatment and endeavor to apply those which are indicated in the individual cases which come under their observation.

With regard to diagnosis, it will be generally admitted that the typical sore is easily recognized regardless of its size and its duration. Multiple sores also possess the same characteristics as the single ulcer. Its welldefined, though irregular borders, which plainly overhang the base of the sore, together with its painfulness, and the fact that it freely secretes pus and is not indurated around the base, makes its nature plain. The bead-like enlargement of the inguinal lymph nodes, almost invariably present in syphilis, is absent. If there be a secondary invasion of the lymph nodes it is distinctly inflammatory in character and, except at its inception, is always associated with a more marked periadenitis. The lymphatics of the penis also are more generally involved than in syphilis, so that the distinct cord-like swelling seen in the latter disease is absent in chancroid. As soldiers are obliged to undergo regular inspection, at least while in camp, the disease should, as a rule, be discovered early, although when first seen the sores may be multiple owing to the readiness with which auto-inoculation takes place. Sores situated near the frenum may tunnel through it, but do not show any tendency to invade the deeper tissues, spreading along the periphery in this region as elsewhere.

There are, however, atypical lesions which may be confusing. Of these, particular attention is called to the elevated chancroid, the mixed chancre, and the phagedenic chancroid. The rare, elevated chancroid, as its name implies, shows an elevated, rather than an excavated floor. It is most easily recognized when it is associated with other ulcers, which may, or may not, resemble the ordinary type of chancroid. In private practice, I have seen only a single case of this kind. Phagedenic chancroid is to be differentiated by its large size, the rapidity of its extent, and the fact that it is often indurated. Probably due to mixed infection, the phagedenic chancroid does not reproduce a sore of its kind when inoculations are made from its secretion, but, instead, gives rise to a simple chancroid. The mixed chancre, which owes its origin to a double infection by the bacillus of Ducrey and the Spirocheta pallida, presents many different aspects. Usually, it first shows the characteristics of one or the other lesion. Perhaps the chancroid itself may be healed so that induration will manifest itself in the scar rather than in the ulcer itself; or it may be that the ulcer will not respond to treatment and gradually assumes characteristics of a syphilitic sore. Often it will be necessary to resort to laboratory methods to make a diagnosis in these mixed in-It is important to remember that there is almost invariably an association of such organisms as the staphylococcus, the streptococcus, the Bacillus coli communis with the specific microörganisms of chancroid, and, in fact, they may so dominate the field that the latter cannot be found. This is especially likely to happen, in cases that have lasted for some time. The application of chemicals may also make it impossible to find the spirochete. The specific bacillus takes the basic aniline dyes, although the central part remains unstained. It is also Gram-negative. The bacillus of Ducrey is a large

bacillus measuring from 1.5 to 2 mm. and being about 0.5 mm. wide. Its extremities are rounded, and it is so indented or notched on the sides as to give it the appearance of the figure 8. It usually occurs in chains. It grows well upon blood serum, and will also grow in plain rabbit serum, but in the latter medium it soon loses its vitality. When cultured upon blood-serum-agar it retains its vitality for from eleven to fifteen days, as has been proved by human inoculation experiments. Its virulence is destroyed by heat at a temperature of 42° C.

Jambon and Tzanck advise that the lesions be thoroughly painted with tincture of iodine and then covered with an aseptic dressing for a number of hours before cultures are taken, believing that by this method it is possible to destroy or inhibit the growth of associated microörganisms.

With regard to inoculation, experiments upon such animals as the rat, the guinea-pig and the rabbit have failed, although the monkey is susceptible to the virus of this microörganism. Le Sourd also obtained a positive reaction by inoculating the free border of the eyelid of the macacus, or dog-faced baboon. Auto-inoculation is readily effected and in doubtful cases is considered a valuable diagnostic method. Jambon and Tzanck inoculate over the deltoid region in the same manner that one vaccinates against smallpox, protecting the site of the inoculation with a shield or watch-glass. The success of the inoculation can be determined at the end of twenty-four hours, and after two or three days the lesion will have the characteristic appearance of a chancroid. They advise, however, that the arm be examined up to the fifth or sixth day if typical objective symptoms do not appear at the end of the usual time. A sore so produced can be readily destroyed with the cautery point.

The object of treatment is to destroy the specific virus as rapidly as possible without injuring the reparative powers of the tissues, and also to prevent inoculation of contiguous parts. Any application which causes induration of the base of the sore must be avoided, lest such an alteration in its appearance lead some other surgeon, who sees it later, to mistake it for a syphilitic lesion. Our own military surgeons should be careful to follow this advice, for, with the present extensive movement of troops, the soldiers are likely to come under the care of several medical officers within a short period of time. Surgical removal, physical agents, particularly heat and chemicals, both strong and mild, are carefully considered by the authors. The first-named is considered applicable only to small chancroids situated in the coronary sulcus. The authors have resorted to it a number of times, using a local anesthetic. They pass a needle carrying a piece of silkworm gut in such a manner that the little wound made by shaving off the ulcer can be closed longitudinally. Circumcision in cases in which the border of the prepuce is covered by multiple ulcers has also been resorted to. the sores having first been destroyed with the cautery. Dorsal incision of the prepuce to expose sores underneath may also be required. They think that sores due to inoculation of the margin of the wound thus made heal more readily than the original ulcers themselves. This view is not in accord with the experience of the reviewer.

The various measures by which heat can be used are discussed, such as the maintenance of heat in compresses by a stream of hot water flowing through a small spiral tube of lead, the thermocautery, diathermy, and hot air.

Weak antiseptics are given preference over the chemical caustics; and of the former the authors are forced to admit, in common with many others who have tried various substances, that despite its bad odor,

iodoform still holds the position of honor.

Salicylic acid, camphor and resorcin are all considered useful in lesions which become sluggish after the specific poison has apparently been destroyed. Scarlet red is particularly recommended in extensive ulcers

of the glans and coronary sulcus.

With regard to sterilization of the sores, either by heat or by chemicals, it is pointed out that while the application should be as radical as possible it should not be repeated unless the condition of the margins shows that the specific organisms have not been destroyed; that is to say, if the ulcer continues to secrete fluid and presents the characteristic wormeaten appearance at its borders. Some cases seen early have yielded to a single cauterization followed by an antiseptic irrigation and an iodoform dressing. Hot antiseptic irrigations given through a long-pointed cannula have been found beneficial in cases of phimosis in which it is not deemed advisable to slit the foreskin without first resorting to milder measures.

No mention is made of the use of furning bromine in cases of rebellious phagedena. It seems only reasonable to assume that the authors are unfamiliar with the results obtained in the late Civil War by this powerful chemical. It would also seem that they are not familiar with the value of tartrate of iron administered internally. The use of the latter, while wholly empirical, nevertheless gives results, and I heartily recommend that it be tried, together with cauterization by bromine, in persistent forms of phagedena involving the genitals, the groin, and even the abdominal wall which have resisted other measures. The author recommends a somewhat novel method for opening and draining buboes. It consists in passing a large needle from one extremity of the swelling to the other and then leaving in place two large strands of silkworm gut carried through by the needle. The strands are tied over a gauze compress. They have found that sufficient drainage can be obtained by this method and state that the bubo may be cured in less than a week. The only cases in which it failed were those of some African laborers who had the habit of frequently taking off the dressings to inspect the wounds, and constantly reinfected themselves in the region of the bubo by carrying the secretion from their chancroids there. While I would not question the statements made by the authors with regard to this method, I feel that I should give preference to evalcation by a free incision made when the bubo had undergone fluctuation.

Eugene II. Eastman, 40 of Chicago, has successfully treated a case of rebellious chancroid with dichloramine-T, using it first in a 5 per cent.

solution, then after one week increasing it to $7\frac{1}{2}$ per cent. and finally at the end of four weeks bringing its strength up to 10 per cent. The method of application was simple. The ulcer was first cleansed and dried, and then packed with cotton. The solution was dropped upon the cotton with a pipette. Cold cream was applied to the area adjacent to the sore in order to prevent any escape of the solution on to healthy parts. A fresh dressing of this kind was applied every twelve hours. At the end of the first week there was some improvement, and at the end of four weeks the sore was about half healed. It was at this time that the strength of the solution was increased to 10 per cent. Four weeks thereafter the lesion was completely healed. The author states that at no time did the patient experience any discomfort from the treatment and that he was able to continue his work.

This case was a very rebellious one, the patient having been under treatment for five months before he came under Eastman's care. A diagnosis of syphilis had been made and the patient treated for that disease. In fact, Eastman at first made a mistake in diagnosis, which he corrected after demonstrating the presence of the bacillus of Ducrey and the absence of the Spirocheta pallida in smears obtained from the sore. It seems to me that the lesion had been rendered sluggish by the injudicious application of caustics, which led to its being mistaken for

a syphilitic sore.

Catheterization of the Ejaculatory Ducts. Wolbarst,⁴¹ of New York, speaks highly of this procedure in the treatment of chronic inflammation of the seminal vesicles, inasmuch as he has found that the reëstablishment of the lumen of the ducts enables the surgeon to bring about a cure by massage in cases which otherwise would probably have to be subjected to operation. He states that his own experience confirms that of Luys, who found that a catheter inserted into the ejaculatory duct will always pass to the seminal vesicle and never into the vas deferens. Thus, in cases in which little or no secretion was forced out into the bladder by stripping the vesicles before the ducts had been dilated, a copious secretion containing plugs of pus and tissue débris was easily expressed from the vesicles after the ducts had been catheterized. The difference in the urine voided after these two procedures is very striking.

The most common symptoms which follow narrowing or occlusion of the duct are a sense of fulness in the perineum, a feeling of tension in the rectum and sharp pain following coitus. The last named is sometimes felt at the moment of ejaculation and constitutes the so-called spermatic colic. Congestion also results from chronic retention within the vesicle. These symptoms have been gradually relieved by the procedures which

the author discusses.

According to Wolbarst, another important indication for catheterization of the ejaculatory ducts is found in connection with the treatment of spermatocystitis by means of injections into the vas deferens. When performing this little operation, he states that he has sometimes noticed that the solution injected into the vas does not enter the bladder because there

is an obstruction at some point either in the vas itself or in the ejaculatory duct. In some such cases he has been able to pass a filiform catheter into the vas for a distance of 12 to 14 inches, thus apparently proving that the lumen of the latter structure has not been occluded. In such cases dilatation of the ejaculatory duet prior to the injection into the vas deferens had enabled him to recover the injected fluid in the urine. In a case of azoöspermia without any history or evidence of double epididymitis, Wolbarst found a distinct atresia of both ejaculatory ducts. The patient had had several attacks of gonorrhea. The vas deferens on both sides was not occluded, but, notwithstanding their patency, fluid injected into them was not recovered in the urine. This condition was readily overcome by the introduction of filiform bougies into the ejaculatory ducts and, moreover, spermatozoa were afterward found in the seminal fluid.

The technic of the procedure, according to the author, is not as difficult as one might expect, although considerable patience, as well as practice, is required to master it. Any posterior urethroscope which enables the operator to see the openings of the ducts plainly and to penetrate them with fine dilators can be used. He has found a simple Luys tube more satisfactory than any of the more complicated instruments, although he finds it desirable to locate the orifices of the ducts with an indirect urethroscope before beginning the actual treatment. For dilatation, he uses a fine, whalebone filiform which, as a rule, can be passed into the duct for a distance of 2 or 3 cm. and in some cases as far as 5 or even 6 cm. As soon as the patient feels pain, the introduction is stopped. It is left in place for a few minutes, then withdrawn and a larger one inserted. These whalebone instruments the author considers superior to the metal ones which Luys recommends. If the opening of the duct is too small to admit the finest filiform, it is cut with a very small, sharp knife-blade attached to a metal shaft. Dilatation is immediately followed by a vigorous massage or stripping of the seminal vesicle. In conclusion, the author expresses the opinion that this procedure should be tried in every case of chronic spermatocystitis before a radical operation is resorted to.

MISCELLANEOUS.

Keratodermia Blenorrhagica. The subject of keratodermia blenorrhagica was discussed in this review some years ago. Since that time a few cases have been reported, and, in 1916, Graham Little was able to collect 38 cases from the literature. During the last year, Captain Crawford Lundie, of the British Army, has reported 2 cases, and also refers to Gougerot and Clara who reported 2 cases in 1917.

Captain Lundie's first patient was a man, aged thirty years, who had had an acute gonorrhea for eleven days at the time he came under observation. The day after admission he developed a swelling of the left ankle, a circumstance which would indicate that he had a systemic infection.

¹² British Journal of Surgery, January, 1918.

He was given a sensitized gonococcus vaccine which brought about considerable improvement in his condition, although he constantly complained of soreness in the muscles. Seventeen days after admission, a lesion resembling a condyloma was noticed on his penis, but it disappeared within a few hours, only to be followed on the next day by typical lesions of keratodermia on the feet. On the advice of a consultant, the vaccine was discontinued. The ankle swelled also after a few days and aspiration was performed, although the fluid withdrawn seemed to come from the tissues rather than from the joint itself. A few days later it was noticed that the knee was swollen, so 3.5 c.c. of vaccine were given. This treatment was repeated at intervals of a few days. Later, fluid obtained from the knee-joint gave a positive culture of gonococci, but the strain could not be established, so that an autogenous vaccine was not obtained. In the meantime the keratosis had extended up the legs, and later appeared on the hands, arms and penis. The secretion of

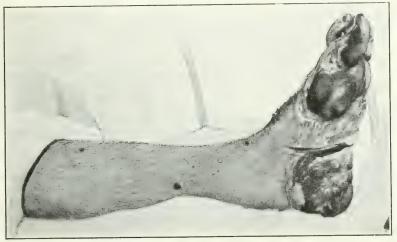


Fig. 10

the prostate showed a diphtheroid bacillus, and, upon advice of Captain Haworth, a bacteriologist, the patient was given a vaccine containing gonococci, diphtheroid bacilli and staphylococci. This was given at intervals of five or six days. A nourishing diet, with tonics, was prescribed, the patient being out in the air when the weather permitted. He improved slowly and later was given another sensitized gonococcus vaccine. At the end of three months his condition was such that he was sent home to England, although the keratosis was still present.

The other case was that of a patient who entered the hospital for an effusion in the right knee, and who developed swelling of the ankle while he was under treatment for the former condition. The keratosis developed on his ankle. He reacted favorably to sensitized vaccines. This patient was not very ill at any time. He denied having had gonorrhea, but his prostate showed evidences of chronic inflammation, and his arthritis, as well as the skin lesions, were very characteristic of Neis-

serian infection. The accompanying illustration shows the condition present in one of Captain Lundie's patients.

Little states that the lesion begins as a small conical protuberance of pinkish color which is hard to the touch and is painless. As it develops, the center becomes brownish, although a pink circle persists around the base. Finally, the central cone assumes the appearance of a vesicle, but when it is opened no fluid exudes, there being inside only a pasty mass composed of epithelium. In the later stages this cone-like portion drys up and the pink circle around the periphery turns white. No permanent scar is left.

It is interesting to note that in the majority of cases these skin lesions develop in patients who have joint involvement and who also not uncommonly suffer from cachexia. The gonococcus apparently cannot be obtained from the lesions.

As to *treatment*, the essential thing is to cure the gonorrhea. Little states that nearly all the authors who have reported cases advise the use of vaccines. With the exception of Gougerot and Clara, who found resorcin apparently beneficial, the authors consulted do not advise any local applications to the skin lesions.

Gonorrheal Complement-fixation Test. Gradwohl⁴³ describes a new method of performing the gonorrheal complement-fixation test, which, in his hands, yields about 56 per cent. more positive results than the older method. The principal difference of this test from the older one is that unheated serum is employed, *i.e.*, the serum is not inactivated. The exact amount of amboceptor hemolytic against sheeps' red blood cells is determined for each serum.

Full directions for making the polyvalent antigen are given.

The test is performed as follows: 14 test-tubes are placed in a test-tube rack. The first 10 test-tubes are used to determine the hemolytic index of the patient's blood serums, the last four are used for the actual test. 0.1 cm. of the patient's serum is placed in each of the first 10 tubes. To this is added 1 cm. of normal salt solution in the first tube, 0.9 cm. in the second tube, and amounts decreasing 0.1 cm. for each successive tube of the first 10. Fresh 5 per cent. suspension of sheep's red cells are now added to the tubes, 0.1 cm. to the first tube, and amounts increasing 0.1 cm. for each successive tube.

Into tube number 11 is placed 0.1 cm. of a diluted antigen-determined titration. 0.15 cm. of the diluted antigen is placed into the next tube, 0.2 cm. into the next tube, 0.2 cm. into the next, and none into the last tube which is the serum control tube. The amount of fluid in all the last four tubes is made up to 0.3 cm. with normal saline solution. The tubes are agitated and with the first 10 tubes are placed in the water-bath for one-half hour.

At the end of this time the first ten tubes are observed for "hemolytic index," that is, the number of the last tube that shows complete hemolysis of the sheep's corpuscles is regarded as the number of the hemolytic index. If the index is between 1 and 4 (inclusive) 0.1 cm. of the sheep's

blood suspension is added to each of the last four tubes; if the index is between 5 and 7 (inclusive), 0.15 cm. is added; if between 8 and 10, 0.2 cm. is added; if over 10, the hemolytic index is determined with increased quantities of sheep's red corpuscles (10 new tubes being used). If then the index is found to be 11 or 12, 0.25 cm. of the blood suspension is added to the original tubes, 11, 12, 13, and 14; if between 15 and 18 (inclusive), 0.3 cm. is added; if between 18 and 20 (inclusive), 0.35 cm. The author regards the test as having doubtful value, if the patient's serum has an index of only 1; otherwise he considers it of absolute value. The reaction is read as is the Wassermann reaction for syphilis, i.e., inhibition or non-inhibition of hemolysis.

The author regards a positive test as a sign of active gonorrhea. In one case that showed a positive reaction, pus was found in the prostate gland in spite of the fact that the patient claimed clinical cure of his urethritis. A man with purulent epididymitis who had yielded a positive reaction by Gradwohl's method, but a negative reaction by an older method, showed a negative reaction by both methods thirty days after the epididymis had been removed. Twenty-five candidates for matrimony who had been pronounced clinically cured, gave negative results

by Gradwohl's method.

In males the test was found applicable to cases of acute anterior urethritis, acute anteroposterior urethritis, epididymitis, prostatitis, seminal vesiculitis, and infections of the bladder, joints, and conjunctival mucosa. The reaction is seldom seen before the third week of infection in the so-called uncomplicated cases of gonorrheal urethritis.

In females the test is of value in cases of acute gonorrheal vaginitis, urethritis, Bartholin gland abscess, endocervicitis, ascending gonorrhea, metritis and salpingitis. The test is even more important in the female than in the male, for the Gram stain may fail to distinguish the gonococcus from the micrococcus catarrhalis. The multitude of vaginal flora also render bacteriological investigation in the female difficult, and cause greater technical difficulties in the cultivation of the gonococcus.

Operations for Undescended Testicle. John R. Caulk⁴⁴ furnishes a review of the recent literature of the treatment of undescended testicle, and adds a procedure that he has found useful in the performing of Beyan's operation with attempt to preserve the vessels of the cord.

Caulk remarks that most authors consider eight to twelve years the most favorable age for operation on undescended testicle, but that others, however, prefer to wait until puberty. The operation achieves a good cosmetic result, and the testicle in the scrotum is kept from harmful influences, such as the pressure of a truss. He states that the abnormality is rather frequent in adult life as is shown in the recruiting of troops.

Among the authors quoted in his review of the literature is Eisendrath, who reports 28 cases in which a modified Bevan operation was done. Eisendrath calls attention to the necessity of thoroughly separating the vessel groups of the cord from each other and from the sac

<sup>Interstate Med. Jour., April, 1918.
Tr. Am. Urolog. Assn., 1916, vol. x.</sup>

(he does not cut the vessels; the remnants of the sac, which have been ligated distally, are united about the testicle).

Wolfer frees the cord, separates the vas from the rest of the structures, exposes the deep epigastric vessels and brings the testicle down behind them. The wound is closed as in the Davison operation.

Mixter⁴⁷ does a modified Bevan operation in which he transposes the

internal ring down to the deep epigastric vessels.

Keyes and McKenzie⁴⁸ report on 42 testicles in which a Beyan operation was done with SS per cent, good results and no mortality. Recently, they do a modified Bevan operation in which the vessels are, if possible, not ligated. If the vas is too short, they suggest transposing it to the inner side of the deep epigastric vessels. The testicle is sutured to the bottom of the scrotum.

Thompson⁴⁹ has had 2 successful cases in which he strengthened the tissue of the scrotum by transplanting into the scrotal incision an elliptical island of skin and subcutaneous tissue taken from near the middle third of a long incision extending from the anterior superior spine of the ilium to the scrotum.

In the Beyan operation Caulk states that the majority of testicles may be brought down completely without ligation of the vessels. He regards as the reason why the testicle cannot be brought down, not the fact that the cord is too short, but that the fascias of the cord are too taut.

Hence, after the sac has been carefully freed and ligated according to the Bevan technic, Caulk holds the testicle up and pulls the cord taut, gradually swinging it around a circle with its center at the internal ring. As each taut band of fascia is seen, it is nicked at the internal ring. The testicle can thus be brought down to the bottom of the scrotum, or even farther, without cutting a vessel. The vas can be lengthened by drawing it taut at the internal ring and making a blunt separation with the finger. If the operator so wishes, the fascias of the cord can be fastened at different levels along the canal, so that the cord can be held taut without too much tension on any one part.

Syphilis of the Epididymis. Lisser and Hinman⁵⁰ report, with a bibliography, a case of syphilis of the epididymis without any involvement of the testicle. They consider the condition as rare, but as often overlooked. They give especial credit to the thesis of Micheel, 51 to which they are indebted for histological and semilogical data. Micheel distinguishes two clinical types; an acute painful type and a more chronic,

slow, painless type.

In the case in question, a man aged forty-seven years, the painful swelling of the epididymis began nine years after the chancre. The report on first local examination was as follows: "The left epididymis is enlarged throughout, hard and elastic, but not particularly nodular.

⁴⁶ Surg., Gynec. and Obst., March, 1915. ⁴⁷ Boston Med. and Surg. Jour., November, 1917.
⁴⁸ Jour. of the Am. Med. Assn., February, 1917.

Lancet, May, 1914.
 Am. Jour. Syph., July, 1918.
 Micheel, Rostock, 1916.

The vas is thickened, but not nodular. The testicle is in contrast small possibly slightly enlarged." A little more than two months later, after antiluetic treatment, we have the following report: "The tumor of the left side of the scrotum has practically disappeared, no marked tenderness on palpation, epididymis is small, the globus major being still somewhat thickened, otherwise it is elastic throughout. The vas is somewhat thickened, but not nearly so much as when seen in October. The testicle is smooth, elastic and quite normal."

The report more than two years later is as follows: "There is no enlargement of epididymis, vas or testicle. Contents of scrotal sac feel negative. The patient's blood and spinal fluid were those of a luetic. Other signs of syphilis were present, especially on the part of the nervous

system."



SURGERY OF THE EXTREMITIES, SHOCK, ANESTHESIA, INFECTIONS, FRACTURES AND DISLOCATIONS, AND TUMORS.

By JOSEPH C. BLOODGOOD, M.D.

Historical. Sir Berkeley Moynihan¹ gives a historical review of the institutes of surgery. In conclusion, he asks this question: "What has been Germany's part in the progress of modern surgery?" Sir Berkeley's answer is that Germany's part has been the same in surgery as in other sciences. In his opinion, the tundamental discoveries in science have originated in England, France and Italy. This is a quotation from Dugald Clark. The German mind is lacking in capacity for original thought. The German mind collects; it is avaricious, industrious and methodical. German literature rarely recognizes, in reference, the publications of other countries.

In the introduction, one gets the impression that Sir Berkeley came to this conclusion before the war, perhaps five years ago. He writes that it came to him with dramatic suddenness. He had been a student in Germany and was familiar with German literature, yet apparently he had accepted the former common view of German supremacy in original contributions to the progress of surgery.

In these numbers of Progressive Medicine since 1899, I have constantly referred to various historical facts. These facts have become of added interest since the experience of this war and have shown that to a large extent the difficulties of wound treatment were anticipated, and the basic principles of wound treatment were developed by our fore-fathers.

In This War the one innovation seems to be the primary excision in the stage of contamination and the primary closure. So far as I can recollect, this was never practised before. The immediate suture of incised lacerated wounds is by no means new. All surgeons have known that in some accidental wounds hemorrhage can be checked and the wounds closed. I have numerous pictures of such cases in the surgical pathological laboratory of the Johns Hopkins Hospital. In one, the wound extended obliquely across the back from the tip of the left acromial process to the right rib. It divided the muscles to the scapula, vertebræ and rib. It was a clean cut with a razor by a colored man on a colored man. The wound was as deep as the thickness of the calf of an ordinary man's leg. It was sutured by through-and-through silkworm gut and silver wire and healed per primam.

The second example is one of primary suture of an incised wound

from the angle of the mouth to the ear; the third the primary suture of an almost complete evulsion of the scalp.

In accidental injuries, surgeons have trimmed lacerated tissue and

closed the wound

The importance of removing foreign bodies to prevent infection has long been known, but the deliberate resection of a huge gunshot wound, removing all the foreign bodies and all the contused and devitalized tissue, as one would resect a malignant tumor, and then the primary closure, is an achievement of this war.

Surgeons have always known the importance of the element of time between the infliction of a wound and its first treatment, but never before has the surgical mind been so concerned with the detailed study of what we may call the stage of contamination and the stage of infection, and never before has the military machine attempted, and so successfully solved, the problem of bringing the wounded soldier in contact with a skilled operating team in a well-equipped hospital in the shortest space of time. This undoubtedly has been made possible by gasoline and the automobile, and by the fact that the development of peace surgery had trained and educated a very large group of men skilled in surgery. They may have been inexperienced in the treatment of infected wounds, but when the treatment of choice, in fact of necessity, was the primary excision of the wound, peace experience came to their help.

In the American Civil War, a number of surgeons came to the conclusion that when amputation was indicated for a gunshot wound of the extremity, it was safer to amputate at once on the field rather than wait for a later amputation in the hospital. This was really an observation along the line of the primary excision of the wound. These surgeons also found that, if they closed the amputated stump when the operation was done at once near the firing line, the wounds often healed, while if

closed in a base hospital the wounds invariably suppurated.

The open treatment of wounds was well understood in our Civil War, and also during that period the overhead extension frames for fractures were devised. When this was revived later, it was called the Balkan frame, and in the beginning of this war the Blake frame. A wire splint somewhat similar to the Thomas splint was developed in the Civil War.

The non-interference treatment of perforating bullet and stab wounds was established by Ambrose Paré before Lister. In the war of 1870, Lister warned the German and French surgeons not to probe the wound with the finger but to simply cover it with a bit of gauze wet in carbolic acid. The aseptic and non-operative treatment of bullet wounds was firmly established in the Franco-Prussian War, and this experience led many military surgeons to the belief that, in gunshot wounds, infection was a primary, rather than a secondary, condition. Nevertheless, as I have frequently mentioned, von Reyherr and others, from their experience in the Russo-Japanese War, concluded that primary infection was always present, but that many of the bullet wounds healed because they were small, contained no foreign bodies except the bullet, but that even with wounds of this character in certain regions infection was so common that they advised the immediate opening of the wound. This was espe-

cially true in bullet wounds of the buttocks, after which gas gangrene

was frequent.

The immediate operation and the wide-open wound, or the immediate amputation in certain cases for emphysematous cellulitis, or gas gangrene, was established in Progressive Medicine in 1899, and we got excellent results from the continuous bath treatment.

The majority of surgeons were not prepared for the proper treatment of wound infection in this war, because, in their civil practice, infected wounds, especially those associated with fracture, were a rare occurrence. They were not familiar with the accessible literature on war surgery, and since 1900 few surgeons took any interest in surgical bacteriology. The necessity of equipping the casualty clearing station or the evacuation hospital not only with a trained personnel, but with all the paraphernalia of a modern civil hospital, was appreciated by only a few until late in the war.

Naval Surgery. As the problems are somewhat different, it seems of interest to discuss the data under this heading. The most interesting review I find collected in *British Medicine in the War*, 1914–1917 (page 15).

Surgeon's Mate. Surgeon-General Sir Arthur May, in his introductory remarks on "Medicine and the Sea Affair," mentions the revived old type of medical officer called the surgeon's mate. These officers were medical students who had begun, but not completed, their clinical work. They were placed in charge of torpedo boat destroyers and other small naval vessels, and the records showed that they performed splendid service in the first treatment of the wounded.

SURGERY. This subject is presented by Deputy Surgeon-General Axford. He emphasizes that all naval units were well equipped with laboratories for bacteriological and other forms of examinations. In discussing wound treatment, he covers practically the same ground that we will cover under this general heading. On the whole, naval surgeons were not satisfied with Wright's aseptic treatment. Naval surgeons ashore and afloat preferred some antiseptic. They record good results with cresol and salicylic acid. Cresol was used in the form of a paste (20 per cent. in lanoline and wax), salicylic acid in form of a powder, equal parts with boric acid, called borsal. In some wounds, previous to the introduction of the cresol paste, carbolic acid was employed. He also mentions a green spray composed of equal parts of a 2 per cent. malachite green in 80 per cent. alcohol and water, and a 2 per cent. perchloride of mercury in 8 per cent. alcohol and water. The Carrel-Dakin treatment was used by naval surgeons later in the war. They also tried the bismuth-iofodorm-paraffin paste, especially in compound fractures, and he mentions Haslar's four-way drainage rubber staff.

Naval hospitals and hospital ships were all fully equipped with surgical gymnasiums and their medico-mechanical apparatus for the functional treatment of bone, muscle, and nerve lesions.

He mentions a very serviceable hypodermic syringe designed by Surgeon-General Wildey, and a metal tourniquet designed by Haslar.

THE SERVICE AFLOAT. The most interesting contribution deals with the handling and care of the wounded aboard the ship. As the wounded

must be transported from small compartments up and down narrow escapes in turrets and around difficult corners, a special stretcher is necessary. The Neil-Robertson stretcher is not unlike the stretcher in the American Navy devised by Stokes, except the pattern was of wire while this is of canvas and bamboo.

The hospital in a fighting ship is called a sick bay, and, as the space is usually cramped, provision must be made for the accommodation of the wounded on the principle of tiers of bunks. Schemes of this kind are applicable for the small space in first-aid stations in the army.

According to Surgeon Hill, in the service affoat, ambrine is used in the treatment for burns.

The majority of fighting ships are supplied with dental surgeons and full equipment, and, as a rule, the larger modern ships have a first-aid station fore and aft, in well-protected areas and placed near the boilers so that they will be well heated.

In the treatment of shock, they depend chiefly upon morphine.

During action, operations are rarely performed, and after the action, if possible, the men are evacuated to a hospital ship for operation and further treatment.

Hospital Ships. These are described by Fleet Surgeon Lomas, and perhaps the most interesting feature has to do with the transportation of the wounded. The wounded sailor is fixed in a canvas cot and hoisted from the small boat up the side of the ship. In a similar way he is slung aboard the deck, carried and then lowered into the ward below deck. The disembarkation appears less perilous. After being taken ashore in the canvas cot, the wounded are transported in the same cot in an ambulance to an ambulance train.

In fracture cases, where it is desired to diminish vibration, a special

device called the gripe is employed.

It would appear from this review that the transportation of the wounded from ships is, on the whole, a less difficult procedure than in warfare on land. As a matter of fact, preventive medicine and hygiene and the physical care of the personnel are the great problems for the naval medical officer. The figures of those wounded in the British Navy have just been published, and they are relatively small. Again and again my colleagues in the Medical Corps of the U.S. Navy have made the statement that after a modern naval battle there will be few wounded, because in the majority of instances the ships either sink or escape, and when the latter, almost scot-free. The figures just published in the New York Times prove the truth of this statement. The great majority of casualties are deaths. The reverse is true of the army. One would not, therefore, expect great contributions on the treatment of wounds from naval surgeons in this war—But in the problems with which they have had to deal and settle, they have developed the greatest efficiency. In spite of cramped quarters above and under water, the health of the sailors has been excellent and the rate of disease affoat very small. When they are ashore at stations or in training camps, the problems are the same as for the army. The venereal problem is a simple one as long as they are aboard the ship. Ashore it is the same as for the army.

War Literature. In the December numbers of Progressive Medicine I began the critical review of military surgery in 1914, and this

has been continued in each December number ever since.

Practically the first report to appear in medical literature is by a naval observer, Surgeon A. M. Fountleroy, U. S. Navy, entitled "Report on the Medico-Military Aspects of the European War." This was published by the Government Printing Office in 1915, and is the best summary of the subject up to that date. Carrel's method is fully described.

A book that should be in the hands of every military surgeon was written by Colonel Robert Jones, in March, 1917. Its title is: *Notes on Military Orthopedics*. All of the more important splints are pictured, and almost the entire orthopedic problem of military surgery is concisely described.

In my opinion, one of the greatest contributions to the war literature is the little book of about 250 pages written by Carrel and Dehelly, published in this country in May, 1917. The French translation is by

Herbert Child.

There is a second book on the *Technic of the Carrel Method*, written by Dumas and Carrel, translated by Adrian V. S. Lambert, which appeared in November, 1917. This confines itself entirely to the technic and does not discuss, as Carrel does, the underlying principles and the development of the method.

A series of War Medical Manuals (pocket edition size) has been

published by Lea & Febiger, Philadelphia:

No. 1. Sanitation for Medical Officers; by Edward B. Vedder, M.D.,

Colonel, Medical Corps, U.S.A.

No. 2. Notes for Army Medical Officers; by Lieut.-General, T. H. Goodwin, R. A. M. C.; with an introduction by Surgeon-General William C. Gorgas, U. S. A.

No. 3. Military Ophthalmic Surgery; by Lieut.-Col. Allen Greenwood, M. C., Lieut.-Col. George E. de Schweinitz, M. C., and Col.

Walter R. Parker, M. C.

No. 4. Military Orthopedic Surgery; by the Orthopedic Council of

the Surgeon-General's Office.

No. 5. Lessons from the Enemy: How Germany Cares for Her War-

Disabled; by Major J. R. McDill, M. R. C., U. S. A.

No. 6. Laboratory Methods of the United States Army; compiled by the Division of Infectious Diseases and Laboratories of the Surgeon-General's Office.

No. 7. Military Surgery of the Zone of the Advance; by Major

George de Tarnowsky, M. C., U. S. A., A. E. F.

No. 8. Military Surgery of the Ear, Nose and Throat; by Major

Hanau W. Loeb, M. R. C., U. S. A.

War Manual No. 2 was written by Lieut.-General Goodwin, of the British Army Medical Corps, and is entitled Notes for Army Medical Officers. It is concise, but presents the subject of organization, administration and sanitation in a most interesting manner. I know of no better short work on this subject. It was written by an experienced

military surgeon who went over with the first army and was in the first battle of the Marne, where the Medical Corps went through its extreme test. Lieutenant-General Goodwin was later assigned as adviser to Surgeon-General Gorgas in Washington, and then was called back to England to become Surgeon-General of the British Army. In connection with this there is an interesting little booklet which appeared in July, 1915, entitled Memorandum on the Treatment of Injuries in War, Based on the Experience of the Present Campaign. This was written after about ten months' experience. At this time splints had been pretty well standardized, but the treatment of infected wounds was chaotic.

In 1917, the British Medical Association published a larger pamphlet, British Medicine in the War of 1914–1917, which will be reviewed here. The little book on First Aid in the Trenches, by Sommerville Hastings, was reviewed in the December number of Progressive Medicine,

1917, with many of his illustrations.

Very quickly after our army reached France, and during the training preliminary to fighting, a committee of American surgeons published a little pamphlet describing and picturing the standard splints for fixation of the upper and lower extremity on the firing line and at different points back to the base hospital. The majority of these splints have been described and illustrated in Progressive Medicine for December, 1917.

In connection with Colonel Jones's book on Military Orthopedics, one should read War Manual No. 4, on Orthopedic Surgery. This is a summary by the Department of Orthopedic Surgery on the essential facts which every military surgeon should know in regard to orthopedics. It is based on Colonel Jones's book, and all the data that could be gathered from the experience of French and British surgeons. It is a valuable book for a knowledge of orthopedic diagnosis and treatment in time of peace.

In connection with Colonel Goodwin's writings on organization and administration in the British Army, one should read the Official Manual for the Medical Department of the U.S. Army. I have before me the

edition of 1916.

Major Gilbert E. Seaman, chief surgeon of the Wisconsin National Guard, and now Colonel and Division Surgeon of the famous 32d Division from Wisconsin and Michigan, compiled in June, 1917, a Compendium for Medical Officers. In this little book he has tried to gather together, from the manuals of the U.S. Army and from the literature up to date, all the most important data on organization and administration, on camps and hospitals, on sanitation, on equipment, requisitions and reports, on the physical examination of recruits, on the rations and physical hygiene of soldiers, on the duties of medical officers, on various positions from the regiment to the base hospital, and on the treatment of wounds. It is published by the Adjutant-General's Office of the State of Wisconsin.

The Division of Surgery of the Surgeon-General's Office published periodically a little pamphlet called *Review of War Surgery and Medicine*. Unfortunately, I have not received all its numbers, but they may be

obtained by writing the Surgeon-General's Office. They contain excellent reviews of the latest publications and reports from the front.

The journal published by the Association of Military Surgeons of the U. S. Army, *The Military Surgeon*, appears monthly with its original articles and reviews of recent literature.

The Bureau of Medicine and Surgery of the U. S. Navy publishes the Naval Medical Bulletin. In the coming January they expect to make a special report on the Medical and Surgical Developments of this War. Surgeon-General Braisted writes me that the General Staff of the British War Office publishes a Medical Supplement, and the Red Cross Society

in this country a Review on War Medicine.

Colonel F. H. Garrison, acting librarian of the Surgeon-General's Library, calls my attention to a single volume, published by C. V. Mosby Co., of St. Louis, in 1918, entitled Abstracts of War Surgery. This book consists of a collection, in a single volume, of the official publications from the Surgeon-General's Office, A War Review of Medicine and Surgery. Colonel Garrison also mentions the book of Arthur F. Hirst on Medical Diseases of the War. The article on "Shock" in this book was reviewed by me last December in Progressive Medicine.

The American Medical Association published in 1917, for the office of the Surgeon-General, a little pamphlet on *Venereal Diseases*, which is

the best summary of the subject up to date.

Numerous books have appeared with the title of War or Military Surgery, but none of them have been able to keep pace with the advances made by the experienced workers in the trenches and in the hospitals behind the firing lines in France. With an exception here and there, the members of the profession who have had the greatest experience and are still working have had little opportunity to write more than short articles. It is not yet time to summarize what we have learned from this

war, either in sanitation, medicine or surgery.

One pamphlet, which I have just received, gives promise that later the entire medical profession will be surprised by the discovery and progress made possible by this huge experience and the stimulation of its environment. This pamphlet is on Trench Fever, and the investigation was conducted by Major Strong, professor of tropical medicine at Harvard and a former student of Johns Hopkins. He has had large experience with tropical diseases in Manila, and was sent by the Red Cross to Serbia to study typhus fever. This committee attacked first the practical problem of the prevention of typhoid fever, and demonstrated that it was transmitted by body lice. The etiological factor has not yet been discovered, but we now know how this fever, which causes so much disability in the armies, can be prevented. The work of another committee from the British Army in Egypt discovered the cause of bilharzia and its prevention.

We trust that the experience of this war will lead to a definite treatment of all forms of wounds, and investigation into the bacteriology of wound infection, with the hope that some preventive or curative serum will be discovered. The experience of this war has shown that we can prevent tetanus, typhoid and cholera, and perhaps some of the dysenteries, by a preventive serum. But up to the present time measles, mumps, scarlet fever, and influenza, with their complicating pneumoniae, break out in our training camps, at home and abroad, on the transports and in the trenches, and, so far, we have done but little either to reduce the number of cases, or decrease the mortality, and in the majority of cases the little that the medical profession feels should be done as a matter of precaution and prevention, the military necessity apparently did not allow. Our troops still are to a large extent overcrowded in barracks, here, in France, and on the transports. As long as there are no measles, mumps, scarlet fever and influenza, the number of cases of pneumonia is small, but the moment an epidemic of one or the other starts, pneumonia, with its terrible mortality, begins and runs its course.

Apparently, a great deal has been learned about the lesions of the nervous system in this war, especially the metal group under shell shock.

The medical and surgical aspects, as based upon the records of the physical examination of registrants in selective service, is still to be written, and as the war has stopped, these records will be incomplete, except for the ages between twenty-one and thirty-one.

The knowledge of what we can do in reconstruction is still to be acquired, and, although even up to the present time the literature is

large, it is not conclusive.

Regimental Aid Posts and the Treatment of the Wounded in the Zone of Action. In my previous communications,³ I was compelled to call this important area of the activities of an army surgeon the silent zone. I have found few contributions from the medical heroes, both officers and men, who had to do with the collection of wounded from no man's land. The first treatment in the cramped regimental aid post and the transportation in the trenches are most graphically described in the various books written by soldiers who have gone over the top.

Surgeon-General Bowlby and Colonel Wallace, consulting surgeons of the British Army in France, write in *British Medicine in War*, 1914–1917 (page 30), as follows: "It is unnecessary to write at length on the work of the regimental medical officers, for his duties in this war are much the same as they ever have been. He shares the dangers common to the combatant officers and men, and his treatment can only be that of first aid; but he and his orderlies have saved innumerable lives both by the rescue of wounded comrades from dangerous situations and by careful, rapid transportation to the field ambulance section of the support line."

The Field Ambulance. In the British Army this is the zone between the firing line and the casualty clearing station. Its problems are transportation, and, in some instances, treatment in advanced dressing stations. In the great majority of cases the first real treatment of the

wound must be done in the casualty clearing station.

In transportation the essential feature is time, and this has largely been conquered by the motor ambulance. Surgeon-General Bowlby and Colonel Wallace⁴ write: "Without the motor ambulance the whole

⁴ Loc. cit.

³ Progressive Medicine, December, 1914, 1915, 1916 and 1917.

system would break down, for no horse vehicle could possibly deal with the number of wounded without blocking the roads for all other transport, and even then the slowness of the horse ambulance would prevent the wounded reaching the casualty station in the proper time."

These two surgeons give the time of evacuation to the casualty clearing station for 200 wounded; 78 arrived within six hours, 34 within nine hours, 22 within twelve hours, 25 within eighteen hours, 10 within twenty-four hours and in only 31 was the time over twenty-four hours.

According to these British surgeons, very little can be done in the advanced dressing stations beyond redressing, when indicated. The following instructions to the field ambulance of the British Army give a concise idea of what should be done.

1. Only operations of emergency should be performed, with the following exceptions:

(a) Completely smashed limbs should be removed and the patients

not transported for at least twenty-four hours.

(b) Hemorrhage should be arrested by ligature; when this is not possible, by plugging or pressure. Patients should never be transported with tourniquets on their limbs.

2. Abdominal wounds, and all injuries requiring early treatment, should be transported by special motor ambulance direct to the casualty

clearing station.

One of the chief functions, therefore, of the medical officers of the field ambulance is the selection of those wounded who should be retained for immediate treatment and those to be transported for the earliest possible

operation at the casualty station.

The equipment of the field ambulance in this war has been greatly improved and increased, chiefly to allow the performance of urgent operations and by larger tent accommodation which will allow retention temporarily of more of the lesser wounded, so that the transportation facilities can first be employed for those wounded whose life or limb depends upon rapid transport to the casualty clearing station. No emphasis is placed upon any attempt to disinfect the wounds in this zone, especially those that are to be transported at once.

Casualty Clearing Station. In my previous communications in Progressive Medicine, I have described the development of this in the British Army, and how, as each month passed, more and more surgery was done in this zone. The entire literature of the war seems now to be in full accord that the future of the wounded, and the prevention of infection rests upon the early and radical excision of the wound.

Today I am in receipt of a personal letter from the front describing the operating teams who are sent forward from the base hospitals to work in groups and, in turn, at these advanced operating stations. As a rule, the operating room provides for four or more teams. When the casualties are large, each team operates eight hours, dresses cases six hours, sleeps and eats ten hours. The four or more teams operate continuously night and day.

Bowlby and Wallace⁵ give the following table compiled by Captain

Hay, which conveys a very good idea of the operative work of a single unit in the casualty clearing station during a recent battle:

Α.	Ligation of arteries														277
В.	Operations on compou	nd	frac	tur	es										1403
C.	Operations on joints (kne	e 18	3)											247
	Amputations														431
E.	Drainage of pleura														49
	Wounds of abdomen														106
G.	Removal of testicle														33
H.	Ruptured urethra.														9
	Enucleation of eye														43
K.	Plastic operations.														33
L.	Tracheotomy														17
M.	Excision of wounds of	sof	t pa	rts											1816
N. Conditions not due to gunshot wounds:															
	Appendicitis .												3	4	
	Strangulated hernia													1	
	Cellulitis												-	3	
	Various]	.3	
													_		101

It is interesting to note that during this period in which 4554 operations were performed, there were 20,589 wounded admitted to this particular unit. Operations for fracture and large soft-part wounds predominate. The number of operations upon the abdomen was smaller than usual, because this casualty clearing station happened to be near a special advanced operating center for abdominal wounds. These figures show the necessity of relays of teams of surgeons, nurses and orderlies.

Special Hospitals. The experience in this war has shown that the usual hospital provided for in British, French and American regulations are not always adequate. I have already noted that the casualty clearing station has grown in size and importance, but, under some circumstances, especially during heavy fighting, it has been found necessary, instead of having a large unit, to distribute for the same area a number of small special hospitals of from fifty to sixty beds, and in some cases some of these smaller special hospitals are selected for the early operative treatment of certain classes of wounds, especially abdominal. Others are selected for the early operative treatment and retention for head cases.

At the base and at home, special hospitals have been organized for the treatment of shell shock, skin diseases, heart cases and for special

orthopedic lesions.

X-rays. According to Bowlby and Wallace, the supply of x-ray machines in the British Army was not only inadequate, but they were not, at first, placed in the more advanced stations. Now there are not only mobile x-ray vans, but all casualty clearing stations and special hospitals near the front are supplied with stationary plants. Experience has demonstrated the great value of fluoroscopic examinations and x-ray plates, which should be carefully studied before the operative treatment of all gunshot wounds. The x-rays locate the position and number of foreign bodies, especially the ragged pieces of shell and shrapnel, fractures and the displaced fragments of bone.

The Hospitals of the American Expeditionary Force. Colonel Charles H. Peck⁷ describes our hospitals in a paper delivered before the New York Surgical Society in October, 1918. The division surgeon is responsible for the positions of aid posts, dressing stations, routes of evacuation, for stretcher-bearers and ambulances. He is in charge of the instruction of officers, enlisted medical personnel, of the field hospital and the ambulance company. Upon his plans and directions depend the rapid collection and evacuation of the wounded to the operating hospitals, and to the hospitals for special cases. The division surgeon is also responsible for all the necessary supplies, especially the proper splints for the aid posts and for the application of heat and warm blankets in the treatment of shock. The stretcher-bearers must have splints to fix the fracture where the soldier falls. The most important splints are the Thomas leg, thigh and arm splint, and Cabot's posterior wire leg splint.

I have pictured these in previous numbers of Progressive Medicine.



Fig. 11.—Mobile Hospital No. 2, A. E. F., showing Bessonneau tents (capacity, 200). (Peck.)

In the very beginning of the war a committee of American Surgeons investigated the splints in the French and British armies and published a little pamphlet with an illustration and description of each splint and how and where it should be employed. These splints are also reproduced in the War Manual on Orthopedics published by Lea & Febiger.

In the treatment of the wounded soldier from the time he falls until he reaches the evacuation hospital, the Medical Corps men receive instructions on the control of hemorrhage, the application of the first-aid dressing, the fixation of fractures in splints, the treatment of pain and shock. For pain and shock, morphine; for shock, hot drinks with bicarbonate of soda (Todd's potion), blood transfusion and gum infusion. Both the officers and men of the Medical Corps must be taught which of the wounded should be held temporarily for rest and which should be transported at once. The antitetanic serum is given in the forward station. ⁷ Annals of Surgery, November, 1918, lxviii, p. 463.

These men of the Medical Corps in the forward zone have always in mind to transport the wounded to the evacuation hospital, if possible within eight to ten hours. Then the operation may be performed in the stage of contamination and before the stage of infection. The operation of choice is complete excision, with immediate closure or delayed primary suture. Eight per cent. of the war wounds are due to shell fragments grossly infected and filled with foreign bodies.

When the wounded reach the evacuation hospital later they are in the stage of infection. Complete excision may not be possible as in the earlier cases, but the wound must be opened widely, foreign bodies removed, mechanically cleaned, and the Carrel-Dakin treatment instituted, or some form of chemical disinfection with the object of an early secondary closure when the bacterial count demonstrates that the wounds are surgically germ-free.

We all now know that delay in this primary operative treatment means prolonged convalescence, increased scar tissue, more impairment of function, a more difficult orthopedic reconstruction and even the loss of life or limb.

We can, therefore, see at a glance that the most difficult and important problem is the rapid collection and transportation of the wounded, and that the wounds can be best treated in the evacuation hospital which should be as near the firing line as circumstances will allow.

The mobile field hospital of the American army is seldom used for operation except in emergency. Its chief function is the care of the temporary sick and minor accidents. It has been found necessary to employ one of the four field hospitals for each division for the treatment of gas cases. These have been large in number in this war; they require immediate attention before transportation.

This is the first time that I have seen it emphasized that provision should be made for the treatment of "gas" cases in the forward zone by the field hospital. In times of stress sometimes a field hospital is employed as a mobile operating unit.

The evacuation hospital, or those in which the majority of operations are performed, are placed from eight to twelve miles behind the line and are attached to sectors and not divisions. They are of two types: The American Evacuation Hospital, called in the British service Casualty Clearing Station, and the new Mobile Hospital, called by the French Antochir. The latter may be a part of the evacuation hospital, or an independent unit.

This first-line operation hospital in the recent years of the war increased its capacity to two or three thousand patients, and in time of battle its personnel was augmented by numbers of mobile operating teams sent from quiet sectors. Often twelve teams worked at a time in eight-hour shifts, day and night. In many instances it was found necessary to establish smaller mobile hospitals nearer the firing line (Fig. 11). Here were operated upon cases in which transportation was dangerous, chiefly injuries of the head, thorax and severe multiple injuries.

It was not only the improvement in rapid transportation, but the improvement in the equipment of the forward hospital that led to the tremendous change for the better in the results of the wounds.

Under the supervision of Colonel, now General, Finney, Chief Consultant of the Surgical Service of the American Army, an organization was rapidly developed to meet these requirements which the British and French found essential after disastrous results of the early years of the war.



Fig. 12.—New hospital train, A. E. F. (sixteen cars; capacity, 350 to 550 patients.) (Peck.)

Fig. 12 pictures an American Hospital Train, sixteen cars, with a capacity for 350 to 550 patients. Fig. 13 is a strikingly vivid picture of a battalion aid post.



Fig. 13.—Battalion aid post. Underground in a forest. (Peck.)

Shock. The Etiology of Shock. Erlanger, Gesell, Gasser and Elliott⁸ produced shock by various intra-abdominal manipulations, by partial occlusion of the inferior vena cava, by occlusion of the thoracic

aorta, by injection of epinephrin and by plugging the portal radicals

to the liver. The following is their working hypothesis:

Continued deficient blood supply leads to a reaction of an inflammatory type in which engorgement of the smaller veins and capillaries and an exudate of plasma predominate. Perhaps the causative factor of the shock may be due to the effect of pain stimuli on the vasomotor mechanism. But this is by no means certain.

In spite of numerous communications, based upon clinical and experimental investigation, I find nothing to add on the etiology of shock which has not already been discussed in my former contributions to Progressive Medicine. Many are still interested in the relation of fat embolism to shock, and more and more writers speak of a toxic shock, apparently associated with the toxins of necrotic tissue and not with bacteria or their toxins.

My own view that shock can be produced without the external loss of blood seems to be substantiated by the observations in this war. Unfortunately, in military surgery the best time to institute the treatment for shock is in the most inconvenient and exposed environment, when the

number of wounded is large and they must be transported.

Cushing, and others, call attention to the fact that it is dangerous to delay operation because of shock if the condition of the wound is keeping up the shock, and when the proposed operation is designed to remove these factors.

Acidosis in Surgery. Crile⁹ contributes another very interesting article on the value and limitations of laboratory studies in acidosis. He begins his article with the following sentence: "It has been suggested that acute blood acidosis and diminished reserve alkalinity may be a cause of shock." To determine this, experiments began in his laboratory in 1912. The result of these investigations forced the conclusion that no laboratory deduction should be considered valid until it has been tested in the crucible of the clinic. Clinically, the striking feature of shock is exhaustion. The success of clinical therapeutic measures, such as oxygen, the intravenous injection of sodium bicarbonate with glucose, and, above all, sleep, lend support to the laboratory conception that intracellular acidosis is the fundamental condition present in exhaustion from any cause.

Shock in War Wounds. Gatelier's observations are based on the ambulance service and a large number of wounded. Apparently, he recognizes the types of shock emphasized by Crile: nervous (psychie), hemorrhagic, toxic and septic. The author does not include the results of exhaustion and cold, which he calls pseudo-shock.

In his opinion, shock due to hemorrhage calls for immediate operative intervention—hemorrhage must be checked. During the operation he

gives adrenalized salt solution intravenously.

Toxic shock he describes as a condition associated with large, open wounds of muscles, especially of buttocks and the thigh, with compound

Annals of Surgery, November, 1918, xlviii, p. 457.
 Bull, et Mein, de la Soc. de Chir. de Paris, 1918, xliv, 11; Abstract, Surg., Gynec. and Obst., 1918, xxvi, 539.

fractures of the femur. In such cases the muscles are cold, discolored, and show every evidence of lack of circulation. This toxic shock is often observed when the tourniquet has been used and left on too long. In his opinion, the dead tissue should be removed immediately, either by amputation or excision. Patients with this type of shock are given hypodermic injections of ether or serum. The principle, therefore, is to remove the dead tissue.

There is nothing new in this attitude. The reviews in Progressive Medicine have always advocated the immediate removal of the cause of shock, if it can be demonstrated that it is still active. Harvey Cushing whose article I have reviewed, also emphasizes the importance of immediate operation on brain injuries, because the shock is kept up by the local conditions in the wound and any delay in the general treatment is harmful. This general treatment can be begun at once and continued during the operation upon the wound in the skull and brain tissue.

The reviewer remarks: "This immediate operative treatment of shock, at least in certain cases, would have previously appeared revolu-

tionary, or may even yet be so considered by many."

This is an old and often discussed problem, but I always thought it had been settled. Immediate operation on patients in shock are indicated, even urged, if the surgeon is of the opinion that the operative procedure can remove one or more causes of the shock, and, as Cushing aptly remarks, the essential treatment in shock can go along with the operation: subcutaneous or intravenous salt, blood-transfusion, etc.

Rouhier, 11 from his large experience, recognizes the types of shock described by Gatelier, but adds shock due to cold and fatigue, and also mentions complex shock in which all the elements are joined to a greater

or lesser degree.

Rouhier then describes another variety of shock which apparently corresponds to Gatelier's toxic shock. He observed it after crushed wounds. He distinguishes it from hemorrhagic, nervous and septic shock. It comes on at once, even in cases in which there is no hemorrhage, and he apparently believes that it is due to the absorption of some substance or substances in the crushed devitalized tissue. In his experience, it is the most extreme type of shock and has a high mortality.

The Treatment of Shock. Rishmiller¹² reviews the therapeutic agents: (1) adrenalin chloride; (2) pituitrin, (3) blood transfusion; (4) hypodermoclysis; (5) enteroclysis; (6) intravenous salines; (7) morphine.

I believe the most effective treatment of shock is its prevention. By careful preoperative study and preparation, by combination of local with general anesthesia, by perfect hemostasis and gentle handling of the wound, by the most vigilant observation of the patient before and during operation, we can, in the large majority of cases, prevent shock or so control it that it is not a cause of mortality.

12 Journal-Lancet, 1918, xxxviii, 43; Abstract, Surg., Gynec. and Obst., 1918, p.

538.

¹¹ Bull. et Mém. de la Soc. de Chir. de Paris, 1917, xliii, 2169; Abstract, Surg., Gynec. and Obst., 1918, xxvi, 451.

Of course, in shock due to wounds other than operative, we have little or no opportunity for its prevention, except in the handling, transportation and treatment of the patient prior to operation and exercising our judgment when the operation should be done.

A thorough knowledge of sensitive tissue and manipulations which produce afferent impulses allows the surgeon in many instances to avoid

traumatism in operation and in the handling of injured people.

I would add to the seven therapeutic measures of Rishmiller, external

heat and low position of the head.

When the patient upon whom I am operating or who is admitted to the hospital, exhibits signs of shock, the most accurate of which is lowered blood-pressure, he is first placed in the Trendelenburg position and external heat is applied. Then, if the blood-pressure does not react, subcutaneous salt is given. I have discontinued adrenalin chloride, pituitrin and strophanthin, but always use morphine in small doses for pain or restlessness. Intravenous salt and blood transfusion are now reserved for cases of hemorrhage. In the operating room, cases of shock are not transported until the blood-pressure shows improvement. Accident cases are always brought directly to the operating room, placed on the table in the Trendelenburg position, covered with warm blankets, and are not undressed, except enough to expose the wound.

Soubeyran¹³ recognizes a non-hemorrhagic shock in certain types of wounds. He speaks of the serum treatment by intravenous administration and prefers Locke's serum. He emphasizes the importance of the head-low position, external heat and morphine. He speaks of Todd's potion*(I have been unable to find out what this is) and strychnine in

large doses.

Cannon, Fraser and Cowell¹⁴ emphasize the following points:

Cooling increases shock, as shown by the lowered blood-pressure. Surgical operations increase the acidosis and fall in the blood-pressure.

They advocate, therefore, the importance of heat and protection from wet by sending blankets and waterproof sheet blankets with the stretcher. From the very onset, the wounded man should be protected against the loss of heat. He should be given a hot drink and a dose of morphine when first aid is applied. This protection against cold and the giving of a hot drink should be maintained throughout the entire transportation. All first-aid stations and subsequent redressing stations should be furnished with stoves, hot blankets and warm drinks. In this way, during transportation one of the causes of shock can be prevented. Apparently, Todd's mixture, just mentioned, is a hot drink of sweetened tea containing a dram of sodium bicarbonate.

If possible, all ambulances and other means of transportation should be heated. The entire Medical Corps in first-aid stations and in ambulance companies should be instructed in regard to the application of heat and the importance of hot drinks. They emphasize the importance of an alkali (sodium bicarbonate) to combat acidosis. Cared for in this way

Bull, et Mém, de la Soc, de Chir, de Paris, 1918, xliv, 672; Abstract, Surg., Gynec, and Obst., 1918, xxvii, 414.
 Jour, Am. Med, Assn., 1918, lxx, 618.

the wounded soldier is in better condition for immediate operation when he reaches a station in which it can be done.

Locke's Serum. Delaunay¹⁵ gives the formula as follows:

	FIRST	SOLU	FION.	Ordinary solution.	Strong solution.
Gum arabic				30.0 gr.	$50.0 \mathrm{gr}$.
Chloride of sodium				8.0 gr.	$6.5 \mathrm{gr}$.
Chloride of potash				0.2 gr.	9.8 gr.
Bicarbonate of sodium .					$0.5 \mathrm{\ gr}.$
Glucose				1.0 gr.	1.5 gr.
Water				990.0 gr.	990.0 gr.
SECOND SOLUTION.					
Chloride of calcium				$0.2 \mathrm{\ gr}.$	1.0 gr.
Water				10.0 gr.	10.0 gr.

This is to be used as a substitute in cases of shock with hemorrhage. Its object is to replace the lost protein substance. However, in the third International Congress for the Study of War Wounds¹⁶ it is noted: British surgeons employ intravenous injection of a 4 per cent. solution of sodium bicarbonate in doses of 500 c.c.; other saline solutions have not given definite results.

Bayliss¹⁷ also favors this Locke's serum, or gum solution. He does not seem to lay the same stress upon sodium bicarbonate by mouth as advo-

cated by Cannon.

Fraser and Cowell¹⁸ are of the opinion that the best results in shock from hemorrhage are obtained by direct blood transfusion, but calcium hypertonic gum solution may tide the patient over an indicated operation. This solution is better than the ordinary physiological salt solution.

SHOCK, POSTOPERATIVE HEMORRHAGE AND CARDIAC DILATATION. Polak and Hefter¹⁹ give a clinical study of an attempt to differentiate these three postoperative conditions. In their conclusions, they find that the hemoglobin rises from five to fifteen points after ether anesthesia, when such anesthesia occupies more than thirty minutes. The red count is slightly increased, but not sufficient to warrant any conclusions.

After ether anesthesia both systolic and diastolic blood-pressure show a moderate fall, and do not return to normal until from twelve to fortyeight hours. The inhalation of oxygen for a short time after ether anesthesia diminishes this fall in blood-pressure, but is only transient in its effect.

In operative shock associated with much loss of blood, the fall in blood-pressure is greater than after long operations without much loss of blood.

In the opinion of these authors, the pulse-pressure is a better index to hemorrhage or cardiac failure than the systolic pressure.

Lyon Chir., 1918, xv, 211; Abstract, Surg., Gynec. and Obst., 1918, xxvii, 240.
 Surg., Gynec. and Obst., 1918, xxvii, p. 12.
 British Med. Jour., 1918, i, 553; review in Surg., Gynec. and Obst., 1918, xxvii; Abstract, 239.

¹⁸ Jour. Am. Med. Assn., 1918, lxx, 520. ¹⁹ Surg., Gynec. and Obst., 1918, xxvi, 312,

There is a constant rise in the leukocytes after hemorrhage, while they fall in shock.

Interesting as this investigation is, these authors do not give a clear

differential diagnosis.

In my own experience, concealed postoperative hemorrhage is so rare that no one has sufficient clinical experience on which to base a differential diagnosis. The few cases that I have seen and recognized have not been difficult to distinguish, because there has been a period of time between the operation and the onset of the hemorrhage. In a few cases the hemorrhage was so great and the change in the patient's general condition so marked that there was no necessity for either a bloodcount or a blood-pressure record to establish the diagnosis. patients suddenly felt faint and looked pale; within a few minutes their blood-pressure had fallen to below 90, and the blood-count showed marked anemia within a few hours. They were all examples of postoperative gastric hemorrhage. The diagnosis of hemorrhage was confirmed by washing out the stomach and finding blood and the later demonstration of blood in the stools. These cases all recovered. The treatment was as follows: Elevation of the foot of the bed, morphine, ice to the abdomen, washing out the stomach with a cold solution of calcium lactate; calcium lactate solution per rectum, and, in the more severe cases, blood transfusion, or the injection of blood serum; subcutaneous salt was always begun at once previous to the blood transfusion, and, in urgent cases, intravenous salt, while preparing the donor for blood transfusion.

In the second group, when the hemorrhage is slow, the diagnosis is more difficult. Repeated blood examinations are the most helpful. Continuous low blood-pressure does not necessarily mean hemorrhage after operation.

Postoperative cardiac dilatation can be distinguished from hemorrhage by the absence of much change in the blood count, by the increase in cardiac dulness, and, if the patient can be taken to the x-ray room, by

a fluoroscopic examination or an x-ray plate.

I am inclined to the opinion that a failure to recognize postoperative hemorrhage and postoperative cardiac dilatation is due more to faulty observation. The majority of our operative cases do so well that we are very apt not to recognize these complications until they are well-

advanced and the symptoms well-marked.

Anesthesia in the War. According to Bowlby and Wallace,²⁰ chloroform was the principal anesthetic at the beginning, but many objections were found to its universal employment. Ether was then largely used, but men who were exposed to wet and cold had irritated mucous membranes and often bronchitis, and ether, given by the ordinary method, increased the bronchial irritation and postoperative complications, especially bronchitis and bronchopneumonia. This led to the use of Shipway's apparatus for the administration of warm ether vapor. This apparatus can be connected with an oxygen cylinder. Nitrous oxide gas and local anesthesia are not mentioned by these two authors.

I find no uniformity of opinion as to the anesthetic. It is still largely a matter of personal opinion. Near the firing line, if an anesthetic is urgent, chloroform appears the most convenient. My recent experience with chloroform when operating in the region of the mouth and jaw has shown that it is safe, if not pushed to complete narcosis, and even when not combined with local anesthesia, it is remarkable what painful manipulations can be done with the patient in this light anesthesia, often talking and moving, and yet when he awakens he has no memory of

any painful sensations.

In the majority of the hospitals, where major operations are performed, ether by the open drop method seems to be the anesthetic of choice. To get good results with this method and with any form of nitrous oxide and oxygen, one must have trained anesthetists, but a surgeon can direct an unskilled assistant, even a non-medical man, to give chloroform by the method I have just noted. There are one or two articles advocating ethyl chloride. Cushing is using local anesthesia more and more in his operations for injuries of the head. But injured individuals, especially soldiers, who have been subjected to the excitement of the firing line and depressed by their transportation, and whose nerve is more or less impaired by cold and hunger, should not be good subjects for an operation under local anesthesia, and, with few exceptions, it is not mentioned, except for minor wounds and for head injuries.

Preoperative Treatment. Alvarez²¹ considers the question of whether purgation is justifiable before operation, and his conclusions are that it is unnecessary and perhaps, on the whole, adds to the postoperative discomforts and dangers. He bases his conclusions on clinical experience,

experimental data, and gives 44 references to the literature.

I know that my own views in regard to purgation before operation have in the last ten years been radically against it and perhaps in the past five years it has practically been discontinued. In emergencies, when there is no time for preparation, the cathartic should be omitted; in a few instances it can be given in the form of castor oil directly after operation when the stomach is washed out. Such cases are rare.

My attention was forcibly called to the danger of forced purgation many years ago, when I operated on a general practitioner in his country home. He proved to be a nervous patient, and, perhaps because of my inexperience, the operation for hernia begun under local anesthesia was finished under chloroform. This patient began to vomit within a few hours after coming out of the anesthesia and continued to vomit. Within sixteen hours there were definite symptoms of a high obstruction. On performing a mid-laparotomy, I found and relieved a hernia of the small intestine in Treitz's fossa. The patient recovered. I learned later that he had taken, one and two days before operation, numerous cathartics, and, on the night before operation, paregoric to relieve the pain and check the purgation. I have never forgotten this trying situation, and

²¹ Surg., Gynec. and Obst., 1918, xxvi, 651.

it indicated to me that if cathartics were to be employed before operation, it was best to have one or two days' rest between the administration of the cathartic and the operation. This soon led to the conclusion that if a patient rested on restricted diet, cathartics were unnecessary, and an enema the night before usually is sufficient preparation.

In many cases even this is not necessary. Alvarez's careful consideration of the subject should be read, and, I am inclined to think, it will lead to a change in the preoperative treatment by those surgeons who

have not already given up purgation and extreme starvation.

It is not out of place here to mention that the entire older literature on the surgery on diabetic patients laid great emphasis on the importance of starvation before subjecting a diabetic patient to operation. Now we know that starvation is the most approved treatment of a

diabetic, whether to be operated on or not.

The question of food before operation is one that cannot be dismissed with a few words. The majority of patients who are to be operated on and who come to the hospital from active work on the ordinary excessive diet, are undoubtedly more comfortable if they are given a day or two of rest and restricted diet. Undoubtedly, when we must operate on the abdomen and, especially, resect the stomach or intestines, an empty stomach and bowel are helpful, but the stomach can be emptied by lavage the morning of operation. In the majority of individuals the fecal matter is in the sigmoid or rectum within twelve to twenty-four hours and can be removed by an enema.

Postoperative Treatment. Ochsner²² directly after operation gives hot water by mouth and fluid per rectum. Gastric lavage is performed on the indications of abdominal distention, nausea and vomiting. Ice is applied over the cardiac region when there is fever and rapid pulse, and, when the pulse is rapid, salt is given subcutaneously. If there is any sign or fear of a lung complication, the head and chest of the patient are elevated. In some cases the therapeutic lamp is suspended over the abdomena simple method of applying heat. Transfusion of blood is performed in extreme shock. After all laparotomies, when there is no peritonitis, soap-suds and normal-salt enemas and castor oil are administered on the tenth day. Broth, beef tea and gruel are given on the third day. No drugs are given to the patient without direct orders from the chief surgeon.

II. W. Jones²³ favors morphine, grain ¹/₅, hypodermically after all abdominal operations if the patient is restless or vomits quickly after the anesthetic. Rectal saline is given at once, also water by mouth, either hot or cold. Instead of using gastric lavage for persisting vomiting he gives 1 dram of sodium bicarbonate in 6 ounces of lukewarm water and lets the stomach wash itself out. Rarely, in his opinion, is a gastric tube indicated. Apparently, Jones favors continuing morphine, if there is discomfort, every four hours for the first two days. A cathartic is not

p. 403.
 New York State Jour. Med., 1917, xvii, 458; abstract, Surg., Gynec. and Obst., 1918, xxvi, p. 403.

Illinois Med. Jour., 1918, xxxii, 20; abstract, Surg., Gynec. 2nd Obst., 1918, xxvi, p. 403.

administered until the third day. Gas distention is first treated with soap-suds enema. If this fails, a high enema of magnesium sulphate and glycerine to which sometimes turpentine is added.

Postoperative Pneumonia. Cutler and Morton²⁴ present a thorough and complete report on postoperative pulmonary complications from the Massachusetts General Hospital, with full references to the literature

and an excellent summary of the entire subject.

It is the best contribution of recent years. There are 37 lung complications after ether, 12 after gas and ether, 4 after gas-oxygen-ether and local, 4 after gas and oxygen, 4 after local and 2 after ether-anesthol.

The study covers 3490 operative cases during the year 1915-1916,

with 65 pulmonary complications—rather a good record.

They think the predisposing causes are: (1) Poor general condition—age, anemia, alcoholism, arteriosclerosis, weak heart, susceptible lungs. (2) Oral sepsis due to teeth or tonsils. (3) Preëxisting lung lesion. (4) Anesthetic badly given. (5) The presence of some septic foci. (6) Too radical operations that open up unnecessarily pathways to the neighborhood of the lungs. (7) Operations on the epigastrium carry the added danger of lung complications through vascular and lymphatic extension. (8) Exposure to cooling fluids or to draft. (9) Postoperative pain resulting in hypostasis from poor expansion.

They advocate the following prophylactic measures: (1) Careful oral cleansing. (2) Two-day observation before operation to allow a careful examination of the lungs. (3) Carefully administered anesthesia—ether by the drop method; surgeon to be ready to operate when patient is prepared. (4) Avoidance of exposure to cold during and after opera-

tion. (5) Avoidance of operative trauma. (6) Asepsis.

In my own clinic in the past four or five years pulmonary complications of all kinds have been conspicuous by their absence. I am confident that in these years the two factors which have been most marked are better general anesthesia combined with local anesthesia. For three years I used gas and oxygen in the majority of cases when general anesthesia was employed. Now for almost three years I have returned to ether drop by the open method. Apparently, therefore, the combination with local anesthesia which reduces the amount of general anesthesia stands out as one essential factor. I have paid little or no attention to oral sepsis. I have paid great attention to avoid operative trauma and exposure to cold. All cases receive preoperative treatment varying in character and duration with the general condition of the patient and the character of the operation to be performed. The essential feature of the preoperative treatment is rest in bed and restricted diet. The essential feature of postoperative treatment is continuous salt per rectum, with one or more drop-oil enemas. This reduces to a minimum postoperative gas pain and distention of the intestines, and increases elimination. In the majority of cases cathartics are avoided, both before and after operation. With few exceptions, milk and eggs are not given before or after operation. The diet is chiefly well-

²⁴ Surg., Gynec. and Obst., 1917, xxv, 621.

prepared broth, later cooked vegetables and fruit. The majority of patients are moved from time to time, urged to change their position, and the period of absolute rest in bed is made as short as possible. Gastric lavage is employed whenever indicated. Gastric contents is never allowed to accumulate.

The chief postoperative lung complication observed has been a localized bronchopneumonia of an embolic type. This was observed practically only in abdominal cases where there has been resection associated with the ligation of vessels of the mesentery or omentum. During the same period, postoperative thrombophlebitis has practically disappeared.

I feel that we owe much to Crile for his local anesthesia, to Halsted and Crile for our gentleness in handling the tissue at operation, to Murphy for the drop method of rectal injections of fluids and enemas, to

Mayo for the importance of gastric lavage, when indicated.

Patients need constant supervision in the preoperative period as well as throughout the operation and for some days afterward. It does no harm to those who do not need it to pass through this routine, and, unless it is made routine in all cases, it is apt to be overlooked in the group that require it for their safety.

The remark of these authors that the surgeon should be ready to operate when the patient is prepared (p. 649) gives one the impression that the surgeon may not have given his attentive supervision which is

essential for the safety of his patient.

We must all remember that we have passed the stage when surgeons simply operated. The entire object of an operation is to cure the

disease with the least danger.

As I look back over the literature on postoperative pneumonia and other postoperative complications, on mortality, on anesthesia, I am impressed that in this country American surgeons have made a tremendous advance. No nation gives more careful supervision to its sick in the hospitals, but there is still room for improvement, and one of the objects of hospital standardization is, first, by a survey, to ascertain

the facts, and then, if possible, to apply the remedy.

Allen O. Whipple, of New York,²⁵ presents a study of postoperative pneumonitis from the Presbyterian Hospital. These pneumonias occurred after every form of anesthesia, even local. He gives an analysis in 97 cases of the bacteriology of the sputum before and after operation. This is really the first investigation as to the relation between postoperative pneumonia and the presence of the pneumococcus in the mouth, throat or sputa before operation. As this investigation progressed, it was found that, in the majority of postoperative pneumonias, group IV pneumococcus was found in the sputa before operation. Excellent x-ray plates of the chest are appended.

His conclusions are as follows: Postoperative pneumonia is a more frequent complication than either acknowledged or reported; the predisposing factors are recent or concurrent inflammation of some part of the upper respiratory tract, pulmonary congestion, interference with

²⁵ Surg., Gynec. and Obst., 1918, xxvi, 29.

normal respiratory movement the result of an abdominal wound, debilitated condition due to sepsis or cachexia, the increased number and virulence of the pneumococcus during the winter and early spring. The common exciting factor is group IV pneumococcus most frequently found in the sputa. This gives rise to an atypical pneumonia of short duration and low mortality. The x-rays are a valuable aid in early diagnosis. There are twenty-five references to the literature.

Wound Treatment.—Harvey Cushing's²⁶ foreword to his splendid contribution, "A Study of a Series of Wounds Involving the Brain and its Enveloping Structures," should be borne in mind when we read the literature on the treatment of wounds in this war. I have attempted to cover this thoroughly in the Décember numbers of Progressive Medicine for 1915, 1916 and 1917, which portray the almost unexplainable differences of opinion and the apparent lack of the development of any uniform method.

Cushing writes: "When novel surgical experiences, no matter how numerous, are crowded into the period of a few weeks, it is unsafe to draw too many deductions therefrom. Favorable opinions not based on end-results have had to be retracted. This is shown in the story of many of the antiseptics, of abdominal wounds, wounds of the thorax and joints, and of primary and secondary suture of wounds."

Crile²⁷ gives a very short summary of his viewpoint based upon his

experience to October, 1917. He describes four stages:

1. The stage of depressed, lowered resistance and contamination about the first twelve hours.

2. The stage of infection.

3. The stage of granulation and healing.

4. The stage of superficial healing which may be associated with sinuses and deformities.

Each stage has its special problems. In the first stage the indications are: Restoration of depressed local resistance and the destruction of the contaminating bacteria. This is accomplished by complete excision of devitalized tissue and the absolute rest of the part. In this way we render the wound in the best condition to resist and destroy the bacteria which have not been removed by excision.

When Crile writes that no chemical antiseptic can be a substitute for good surgery, he uses an expression which is repeatedly seen in literature. The immediate excision of the devitalized tissue, especially in a war wound, demands good surgery. Apparently there is not as yet a consensus of opinion as to the antiseptic. Crile mentions the Carrel-Dakin, B. I. P., eusol dichloramine-T and flavine.

In the second stage, physiological rest comes first. It requires considerable surgical judgment when free incision should be made and how they should be made. The wound, whether incised or not, should be treated by warm moist dressings. The stage of acute infection is usually over in four days when a granulating surface has been thoroughly organized.

²⁶ British Jour. of Surg., 1918, v, 558.

²⁷ Surg., Gynec. and Obst., 1918, xxvi, 372.

In the third stage of granulation, some of the wounds may be closed by secondary suture, but the open wound still requires drainage and some antiseptic treatment. Crile still is of the opinion that the choice

lies between B. I. P., Carrel-Dakin and dichloramine-T.

George Dehelly,²⁸ who was associated with Alexis Carrel, discusses the Surgical Closure of Wounds. He mentions what now seems well recognized, that in the early period of the war infection was rampant, and explains it by an expectant attitude, perhaps one of non-interference, except with antiseptics. Then came the recognition that the wound should be opened widely and foreign bodies removed. This reduced the acuteness of the infectious process, but the period of healing before complete cicatrization often runs into months.

In August, 1916, Dehelly and Dumas attempted the surgical closure of wounds following the principles of Carrel and Dakin, and since that time, in 90 per cent. of the wounds, complete surgical sterilization was

obtained to allow closure within twelve days.

In 1916, Gaudier recommended complete excision of the recent wound

within the first eight hours, and primary suture.

Dehelly discusses the relative value of primary excision with immediate suture as compared with primary excision followed by the Carrel

method of sterilization and secondary suture.

The chief cause of failure after immediate suture is the presence of streptococci, especially the hemolytic streptococcus. Dehelly rather favors the secondary suture. The wound is excised and sterilized by the Carrel method. The date for closure rests upon the bacteriological examination.

In secondary closure, as in primary closure, there must be no dead spaces and no tension. Even in some cases of granulating wounds, he prefers secondary suture. First, resection of the scar and granulation tissue, then the Carrel-Dakin treatment, then, in a few days, closure.

Martin,²⁰ in an article entitled The Physical Factors Influencing Infection, brings out the knowledge gained in this war. At the outbreak the ruling idea was the avoidance of secondary infection. Now all recognize that the infection is primary.

In previous wars wounds healed, not because there was no primary infection, but, because of the character of the wound, the tissues were able to take care of the infection, and much of the secondary infection

was due to the bad technic on the part of surgeons.

Nevertheless, this idea is by no means new to this war. After the Russo-Japanese War I have reviewed articles in Progressive Medicine, especially those by von Reyherr, who maintained this viewpoint. Surgeons have always recognized that foreign bodies and dead tissue and cavities filled with blood lowered the resistance of the vascular tissues to infection.

In November, 1917, at the Surgical Conference of the Allies, the consensus of opinion favored primary complete excision followed by

29 Ibid., 436.

²⁸ Annals of Surgery, 1918, lxviii, 430.

immediate suture. However, there are still differences of opinion, as

voiced by Dehelly just quoted.

There is no doubt that under the environment of war it simplifies • the treatment of the wounded, if it is possible to get them early, to subject them to this immediate excision and suture. The treatment of an open wound preparatory to early secondary suture is a far more difficult procedure. It is simply a question of results, and it is very difficult, from the literature, or from personal reports, to get exact data.

There seems no question that in some cases immediate excision and suture are successful. On the other hand, there is no doubt that in a certain percentage of wounds there must first be a period in which the wound is left open for sterilization before suture. At the present time there may be individual surgeons whose experience and judgment have reached such a point that they know, in the majority of cases, when to close and when to leave open for secondary suture. But none of them, so far as I have been able to ascertain, have been able to formulate rules which will allow less experienced surgeons to obtain the same results.

It would appear that it is more dangerous to make the mistake of closing the wound and then to have to reopen it for infection than to leave it open for secondary suture. Nevertheless, we must recognize that the Carrel-Dakin or any other method of treating an open wound requires a larger personnel, of both surgeons and nurses, with unusual training and a hospital equipped with all the necessary apparatus.

Fortunately, with either method, the results have improved.

Marquis³⁰ and others, report that in a recent large battle there was constructed for the immediate treatment of the wounded six large operating rooms which allowed 178 operations within twenty-four hours. The majority of the wounded arrived for treatment from six to twelve hours after injury. Apparently only the severer cases were operated on. The majority of the cases were excised and sutured at once: compound fractures, cranial and thoracic wounds. There were 298 patients, with 550 wounds. Of these, 342 involved the soft parts, 132 bone, 34 joints, 15 cranium, 19 abdomen and 12 the thorax. Of these, 109, almost half, were primarily excised and sutured. In 370, the wounds were closed secondarily. Of the 109 closed primarily, 45 had to be reopened. The total mortality was 6.5 per cent.

Stokes and Tytler³¹ present the result of their research on primary and delayed primary suture of gunshot wounds in a casualty clearing station. The chief cause of failure in the wound closed primarily is the presence of a hemolytic streptococcus. If routine cover-slips and cultures are made at the time the wound is excised and closed, the wound may be reopened when the bacteriological report is made. This, of course, is a difficult thing to do, and, according to Dehelly, if one should follow the bacteriological report only, some wounds might be unneces-

sarily reopened.

The authors have not found any antiseptic which, when used at the primary excision, will protect from the hemolytic streptococcus.

³⁰ Bull. et Mém. de la Soc. de Chir. de Paris, 1917, xlii, 2281; abstract, Surg., Gynec. and Obst., 1918, xxvi, p. 503.

British Jour. of Surg., 1918, vi, 92.

From this research they conclude that with careful selection and efficient operation, immediate suture may be done with a large measure of success, while in some wounds immediate suture must be the operation of choice, for example, in those of the head, chest and joints; but, on the whole, these British surgeons are inclined to the view that, in the average wound, delayed suture is safer and more certain in its results. They also express the opinion that when the wounded must be evacuated immediately after operation, delayed suture must be the method of choice. Delayed suture must also be the method when the surgeon is in doubt.

Moynihan,³² when he addressed the Clinical Congress of Surgeons, in October, 1917, put very little faith in antiseptics, and showed himself a great advocate of the immediate excision and primary closure of wounds, and even when the wounds were closed secondarily in the stage of granulation, he was rather of the opinion that, if the granulation tissue of the cavities and sinuses were excised and the wound closed under proper aseptic technic, antisepties, such as B. I. P., are unessential. For the treatment of the open, infected wound he seemed to favor the physiological method of Wright, which, we all know, consists of the application of salt solution as a fluid or in salt packs. He describes the Carrel-Dakin method, but not enthusiastically. He thinks it is a difficult method to pursue without interruption, and if there is interruption, it fails. He also expresses the opinion that the so-called B. I. P. (bismuthiodoform-paraffin) deserves less credit than the surgery which precedes it. He seems to be more in favor of flavine compounds as an antiseptic than any other. Mechanical cleansing, excision of infected and dead tissue and foreign bodies, according to Moynihan, is the supreme necessity in all cases. When this is done early and the wounds closed, 80 to 90 per cent. healed.

So far, I have been unable to find a specific report with such an excellent percentage when the individuals report actual cases in large numbers, yet many of my personal letters from American surgeons in France mention 80 per cent. of successful cases. In one of the best reports which I have just given, the successful closures were a little more than 50 per

cent.

Eighty per cent, seems to represent the general claims, but it is yet

to be proved by actual figures.

In infected cases and wounds which must be left open, Moynihan considers that the physiological methods are as valuable as the antiseptic methods. He believes that the natural defensive powers of the tissues do just as well without an antiseptic. Whether he has changed his views since then I am unable to find out.

Bowlby and Wallace³³ describe the method of wound treatment in the

casualty clearing station of the British Army.

It is necessary in this critical review, in order to give a picture of the different viewpoints, to make considerable repetition of the various methods.

Surg., Gynec. and Obst., 1917, xxv, 583.
 British Medicine in the War, 1914–1917, p. 30.

According to these two surgeons, the prime object of every casualty clearing station is to treat and retain all patients until they can be transported safely back. In quiet periods this is not difficult. In heavy fighting, when many wounded arrive during short periods, there must be some provision for selective evacuation. It is apparently less difficult during this time of stress to provide for the operative treatment of the wounded than to select and to arrange for the transportation of those numbers necessary to create vacant beds for the new cases.

Another difficulty is that the retention of patients in the casualty clearing station throws an added burden by the dressing of wounds on the already overworked operating team. There seems no question that the prime importance after the rapid transportation to the casualty clearing station is the immediate operative treatment of the wound.

I have already mentioned that no attempt is made to disinfect wounds before they reach the casualty station, because it is useless and a waste of time. According to these authors, the most important alteration in the recent treatment of wounds since the early days of the war is that excision of the damaged tissue has become the routine method, and the earlier this is carried out the greater the probability of success.

As to antiseptics, they mention two: Dakin's fluid and eusol. These authors also write that the method of Carrel has been increasingly employed in the past year, with exceptionally good results. But they remark: "When the wounded are arriving in large numbers this method presents difficulties." It is also interesting to note that the continuity of the Carrel treatment is maintained on every ambulance transporting the wounded from the casualty clearing station to the base hospital.

I have always advocated that this was possible, but it is the first time

that I have found it so stated in the literature.

Hydrogen peroxide is employed chiefly to loosen adherent dressings. Carbolic acid, according to these authors, employed frequently early in the war for immediate sterilization, has been discontinued, but many surgeons still employ a combination of 1 to 20 or 1 to 40 carbolic acid with equal parts of hydrogen peroxide. It will probably take the British surgeons many years to lose their faith in the antiseptic that laid the foundations of modern surgery.

Just as the motor ambulance has replaced the horse, so should the

hypochlorites replace carbolic acid and other antiseptics.

These authors apparently do not put much faith in lymph lavage, because they write that the salt pack has largely been supplanted by eusol and Dakin's fluid. However, in large open wounds in patients who must be transported the salt pack is useful during the transport, when it is impossible to dress the wound for a few days and the number of wounded is too large and the personnel too small to allow the Carrel-Dakin method.

The same apparently is true of bismuth-iodoform-paraffin.

Excision and Suture of Superficial Gunshot Wounds under Local Anesthesia. Brock³⁴ makes this contribution from General

Hospital No. 9, in France (Lakeside Unit), and one would expect it from Crile's clinic in France. It should have an important application

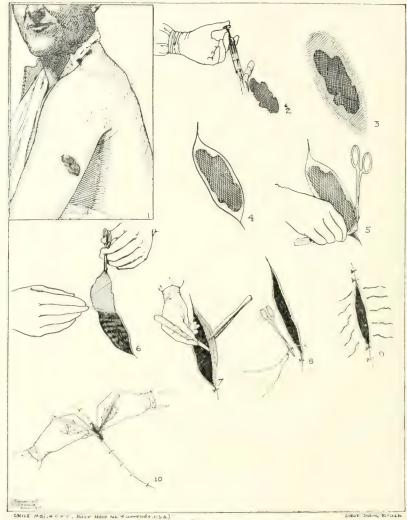


Fig. 14.—1, high-explosive wound, skin prepared with iodine and alcohol; 2, injecting novocain, 1 to 200; 3, an area 5 cm. in width is blocked; 4, in order to obtain an elliptical wound, it is often necessary to begin the line of excision farther away from the wound than the condition of the tissue itself demands; 5 and 6, the excision of the wound en masse; 7, it is advisable in all cases to make skin flaps, as this procedure lessens tension and tends to prevent inversion of skin edges; 8, silkworm-gut suture material is employed; the end sutures are placed about 2 cm. from the beginning and end of the incision, which procedure prevents puckering at the ends; 9, sutures are placed loosely at 2 cm. intervals or wider and about 3 cm. from the margin of wound. The dead space is eliminated by including deeper tissues; 10, skin edges everted, alcohol dressing. (Brock.)

to industrial surgery. The excision of the primary wound, or later of the superficial ulcerating wound, reduces the period of disability and is not

only economic in time of the patient, whether he be a soldier or a worker, but of the surgeon and in material. Figs. 14, 15, 16, with their legends, picture the character of the superficial wounds, the method of local anesthesia, of excision and suture. In the cases reported, the wounds



Fig. 15.—Shrapnel wound after six days' treatment, and six days after excision and suture. (Brock.)

were excised and sutured after four to six days' treatment. Novocaine, 1 to 200, was employed.

The primary treatment of the superficial wound was a hot dressing followed by a wet dressing of 65 per cent. alcohol. The hot application consisted of gauze boiled in 4 per cent. boric acid; the dressings were

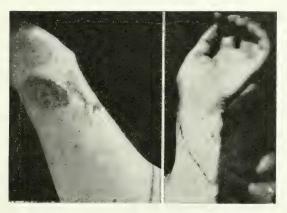


Fig. 16.—High-explosive wound after four days' treatment and seven days after excision and suture. (Brock.)

made three times daily. Now and then the wounds were exposed daily to the sun's rays. When the granulations appeared healthy, the wounds were excised and closed. There was no bacteriological control. The sutures were not removed until at least the eighth day.

He reports 294 such superficial wounds in which healing occurred per

primam in over 95 per cent.

This is simply another important lesson of the war's experience which should be applied to industrial surgery and all granulating wounds. Previous to this war, too many wounds were allowed to take their time in healing. Excision and suture or skin grafting were not usually employed.

This report also demonstrates that the preparation for the excision of a granulating wound may be simple, and many methods of preparing

it accomplish the same results.

For years I have excised and grafted granulating wounds of all sizes without preliminary preparation, except ordinary cleanliness and a boric acid dressing, and the technic of cleaning the granulating surface at the time of the operation has been the same as the technic of the skin employed during the period in which the operation was performed. I find that when the Carrel-Dakin method is employed, one may graft on the sterilized granulation tissue without excision. In some cases this has a great advantage, especially in wounds of the chest wall where the excision bears ribs and cartilage, and when the granulation tissue is on tendons or near the synovial membrane of joints. The application of the Carrel-Dakin to the granulating wound should require no more time than the method of dressing described by Brock.

QUINOFORMOL SOLUTION IN WAR SURGERY. Pilcher, of Brooklyn, N. Y., because Dakin's solution is not stable, is difficult to prepare, and its application irritating to the skin if not properly prepared, and for other reasons, attempted, as many others have done, to get a substitute.

I will not give the formula here, because this paper is but a preliminary

report and we have no evidence as yet that it is a substitute.

From the time of the first publication of the Carrel-Dakin method, numerous surgeons have attempted to get a chemical solution which would accomplish the same results with less trouble and less apparatus. His work has stimulated the entire surgical profession in improving the methods of treatment. This evidence must be interpreted as demonstrating that the Carrel-Dakin method was one of the greatest contributions to wound treatment in this war. I am convinced that many have attempted to find a substitute before thoroughly understanding and mastering Carrel's method. In my experience, the more one uses this method of wound treatment and becomes familiar with its basic principles and trains one's personnel to coöperate, the difficulties diminish and the results improve.

In my clinic at St. Agnes's Hospital we were getting very indifferent results until we sent one of our interns to the Rockefeller Institute, and until Major Stewart, a former member of our surgical staff, made St. Agnes's Hospital a few visits and dressed the wounds for us. It must be remembered that I was familiar with the method, had visited the war hospital at the Rockefeller Institute on a number of occasions, had supplied the hospital with all the apparatus, but it required one more familiar with the details to start the treatment properly. It now moves

³⁵ Annals of Surgery, November, 1918, lxviii, p. 467.

BURNS 241

along smoothly, and many of the dressings are done by the Sisters and senior nurses.

Burns. Paraffin Wax Treatment. Sherman, 36 who has written on this subject before, presents a detailed description with many illustrations. The present article is based on nine years' experience in industrial surgery and attempts to standardize the treatment of some 30,000 cases of burns.

In brief, the burns of lesser degree were treated in the dispensary, and have apparently done well with dressings of boric ointment, or 0.9 per cent. solution of picric acid. Hospital cases, as a rule, have first been exposed to the open-air method, and the burns have been covered with powders followed by the application of dry heat or boric ointment. This method gave less trouble than the continuous bath treatment. Sherman states that one of the basic principles in the treatment of burns was the exclusion of air, but this was really never accomplished until Barthe de Sandfordt perfected the mixture of paraffin and resin (ambrine).

Sherman states that, in spite of opposition, this method is gradually being adopted in military hospitals. Sherman introduced this new technic in November, 1916, and was able to compare it with his previous large experience. In this time he has had about 3000 cases, and it has superseded all other methods and has now been adopted as the standard.

All burns, regardless of character, are thoroughly dried and the burned area is then covered with a coating of paraffin wax. A thin layer of cotton covers the paraffin wax and is incorporated into it by painting over the cotton with a fine varnish brush some more of the paraffin mixture. Then this is covered with cotton and bandages. The wounds are redressed every twenty-four hours. The seropurulent discharge lifts the wax dressing, and can always be removed without pain. The surface of the wound is then cleansed with saline or boric acid and dried and the wax dressing reapplied. It is unnecessary to use any strong antiseptics. The cotton should never be applied until there is a layer of wax. Later, when granulations have appeared in the more severe burns, the granulating surface can be sterilized by the Carrel-Dakin method and grafted. In the majority of less severe burns, complete covering with epithelium takes place without grafting.

I have had no experience with this method, but have gotten equally good results with simple sterile vaseline or boric ointment, properly employed, which means daily dressing and plenty of ointment. The vaseline is more economical than the paraffin wax, but Sherman's experience is so large that one must conclude that this paraffin-wax treatment may ultimately become the standard method.

Sherman does not speak of contractions. I have again and again discussed this in Progressive Medicine as the most distressing complication of a burn. As I look back over my experience with burns, I am forced to conclude that the prolonged healing and the contractures are not due so much to the method of treatment as to neglect. The majority

of cases are not dressed daily. The surfaces are not kept clean. Gauze and cotton are allowed to stick to the surface. For this reason, if we can educate and persuade the general profession to adopt the paraffin-wax method, they may take more interest in their cases. Again, the paraffin wax undoubtedly prevents gauze and cotton from adhering to the wound, and therefore removes the chief cause of discomfort and the chief factor which retards rapid epidermization.

A. J. Hull³⁷ reports his routine treatment as follows:

The burn is washed with a 1 to 1000 solution of acriflavine or proflavine dried with gauze or by an electric drier, covered with a layer of paraffin, then a layer of wool, then a second layer of paraffin, then more wool and a bandage. This is similar, therefore, to Sherman's method, with the exception of the flavine solution. This method makes a flavine-paraffin covering. Later on, scarlet-R (1 per cent.) is substituted for flavine.

Wound Infections. There is a very interesting summary of this subject by F. W. Andrewes, professor of pathology at the University of London. It gives the point of view of an English pathologist. He calls attention to the well-known fact that the majority of modern surgeons trained in asepsis, in the operative technic of the common wound made by operation, found themselves confronted by the vast numbers of huge wounds grossly infected. In the investigation of these novel problems two schools of treatment arose.

One, led by Sir Almroth E. Wright, advocating the so-called physiological method. It is the opinion of Andrewes that the research of Wright and his colleagues was brilliant. They devised various technical methods which have been thoroughly reviewed in previous numbers of Progressive Medicine. The principle of this treatment was to aid Nature's process of combating infection. One process which they could aid was to increase the free flow of lymph, called by Wright lymph lavage. The treatment consisted of hypertonic salt solution with or without the addition of sodium citrate, and heat. The wounds were left open. There was nothing new either in the application of salt solution or the hot applications. At least, the latter and the irrigation with water was a method commonly employed in our Civil War. The objection to this treatment was the attempt to apply it to all wounds in all cases.

The second school worked with some antiseptics. At first, there was an attempt, following the early methods of Lister, to sterilize the wound by a single application of a strong antiseptic—pure carbolic acid, carbolic acid and camphor, ether or iodine. Later, sterilization was attempted by the repeated application of some antiseptics, one or many. Very quickly it was found that the hypochlorites seemed to give the most successful results. Lorain Smith, and his colleagues in Edinburgh, worked with a combination of bleaching powder and calcium borate. The solution was called *cusol* and became very popular; the powder was called *cupad*.

British Med. Jour., 1917, ii, 788; abstract, Surg., Gynec. and Obst., 1918, xxvi,
 p. 354.
 British Medicine in War, 1914–1917, p. 6.

Dakin, working independently in Compiègne with Carrel, introduced a somewhat similar solution which finally led to the development of Dakin's solution and Carrel's special technic of its employment. Later researches of Dakin with Cohn, of Leeds, gave rise to a new chloramine product -chloramine-T, which has been fully described in previous numbers of Progressive Medicine.

The hypochlorites not only became the chief agent for the sterilization of wounds, but also for the disinfection of ships and other infected environment of the army. It is interesting to note that as a disinfectant of ships it was first employed on the Aquitania. It proved not only efficacious, but was far more economical than the previously employed

antiseptics—carbolic acid and cresol.

Flavine and aeriflavine were originally prepared by Benda at the suggestion of Ehrlich for the treatment trypanosomiasis. Later, this agent was studied by Carl Browning, who also included in his researches brilliant green and aniline dyes. Flavine seemed to give the best results, as in proper dilution it appeared harmless to tissue and did not impair the power of the leukocytes. The investigation, however, was more or less impeded at the time this article was written by the difficulty of obtaining the drug.

Andrewes calls attention to the fact that there had never been such an opportunity for the study of all the problems of the bacteriology of

septic wounds.

I have previously called attention to the fact that surgical bacteriology had been more or less discontinued as a subject for investigation since 1900. The condition of war wounds in France made this imperative, and much had to be done to make up for the lack of preparedness. There seems no question now that our failure to continue the investigations of surgical pathology, even on the scanty material of peace time, was a great mistake. Andrewes mentions the important observation of Dale, who discovered that the so-called toxins of certain anërobic bacilli connected with gas gangrene were really the salts of ammonia. McIntosh and Fildes, at the London Hospital, Dean, at Manchester, and Miss Robertson, at the Lister Institute, made extensive investigations on anërobic infections of wounds.

Last year I reviewed the work of Bull, at the Rockefeller Institute, in New York, who discovered the toxin of the gas bacillus and apparently also its antitoxin.

Although not mentioned by Andrewes, it may be stated that, in spite of this tremendous opportunity for the investigation of septic wounds, no protective or curative serum was discovered, except perhaps that of Bull for the gas bacillus. However, there are no reports from the front

as to the practical application of his antitoxin.

The improvement in the treatment of infected wounds has been due, first, to the work of Dakin and Carrell and their method of continuous application of an antiseptic combined with other technical measures of wound treatment. Perhaps the greatest contribution of the war has been the discovery that the best treatment for infected wounds is the early operative treatment, the principle of which is the excision of the

devitalized tissues as well as of the foreign body, and in certain cases the immediate closure.

To make this possible there must be a wonderfully developed ambulance corps. Wounded should be collected and transported with such rapidity that they are brought to the first operation station in contact with the trained operating team within six to eight hours. This transportation must not only be speedy, but, as far as possible, gentle, and during the transportation the wounded must be protected from cold and hemorrhage. No disinfection seems to be of any particular value until it begins with the noted operation under anesthesia. The ultimate triumph, therefore, over infected wounds has been chiefly due to the solving of the military problem of transportation and the surgical problem of a delicate major operation.

When wounds must be left open, the consensus of opinion seems to be that an antiseptic method along the lines of Carrel-Dakin gives better results than the physiological method of Wright. Nevertheless, there is still need for some more certain agent to combat the more virulent organisms, especially the hemolytic streptococcus. There still must be

investigations for protective and curative sera.

Bowlby and Wallace,³⁹ in discussing the bacteriology of infected war wounds, call attention to the mixed infections and the various forms of amebic bacilli, and they observe that the bacillus of gas gangrene and other anërobic bacteria were found to be present in large numbers early in the war, and early in the stage of infection. But in the latter period of the war, these anërobic organisms, especially the gas bacillus, are less frequently observed, especially the clinical picture of gas phlegmon or cellulitis, while the pus-producing organisms, which appear later in the wound, are now the chief cause of trouble. This undoubtedly is due to the change in wound treatment: The earlier intervention, the complete excision of the wound, and better methods of drainage when the wounds are not closed.

The organism which gives most trouble now is the hemolytic streptococcus. Numerous trained bacteriologists have thoroughly investigated the bacterial flora of war wounds, but, as I stated before, the great improvement in results has been due chiefly to military and surgical measures. Since writing the beginning of this chapter on wound infections, I asked Dr. Ford, professor of bacteriology of the Johns Hopkins Medical School, what new discoveries had there been in bacteriology due to this tremendous material, and he answered, "None." No new organisms have been identified, and no preventive or curative sera discovered for wound infection. Undoubtedly, however, surgeons, due to their opportunities, have paid more attention to the growth of bacteria in the tissues of the wounds and to methods of preventing or combating this growth. Apparently, there is no opportunity, by cover-slip or culture methods, to obtain information which will allow a surgeon to decide from the bacteriological report whether to close or leave open the recent wound he has excised. The literature records attempts at this bacterio-

British Medicine in the War, 1914-1917, p. 38.

logical check, but the consensus of opinion is that it cannot be depended

upon.

When wounds are left open for secondary closure, Carrel and his followers place almost entire reliance on the cover-slip study of the secretions of the wound to indicate to them the success of their sterilization and the best time to close. Other surgeons, who also close secondarily, depend entirely upon the picture of the wound and the condition of the patient, and do not employ a bacteriological control. There is no doubt that the latter group records excellent results. Carrel's method, however, appeals to me and many others as more precise and the safer.

Gas Gangrene. Bowlby and Wallace⁴⁰ mention the common occurrence of this wound complication in the early months of the war. The British surgeons recognized two types: gaseous cellulitis and massive gas gangrene. The former was a milder type and confined to the soft parts in the region of the wound. Free incision and drainage usually accomplished a cure. In the latter, the whole limb was affected, and amputation was one of necessity. This wound infection is seen less frequently since earlier intervention with either widely opening the wound, or excising it. All infections, and especially that with the gas bacillus, are encouraged by retention of wound secretion and primary bleeding, by interference with circulation by this retention, or by injury of, or pressure upon, bloodyessels; by the presence of devitalized tissue; by comminution in fractures, and by the retention of foreign bodies. All of these factors are to a large extent removed by the early operative treatment. At first this was wide incision and removal of foreign bodies, blood clot and some of the dead tissue, and later the method developed to complete excision. But surgeons must also remember that when for one reason or other the wounds cannot be closed, provision must be made for drainage, and dressings not be allowed to dry or cake. Surgeons must bear in mind that when they excise and close, the patients must be under constant supervision for the immediate detection of an infection and the immediate reopening of the wound.

RECURRENCE OF GAS GANGRENE AFTER AMPUTATION. In Progressive Medicine for December, 1899, I reported one such case which was reamputated, and a second case in which somewhat later an abscess was found in the stump some months after amputation. In the pus of this abscess gas bacilli were demonstrated in culture and animal experiments by Harvey Cushing, but there was no gas in the pus, nor in the tissue

about the encapsulated abscess.

Bowlby and Wallace⁴¹ discuss this interesting occurrence. Cases have been observed when the amputation has apparently been through uninvolved tissue. They call attention to the observation of McNee and Dunn who found the gas bacillus in healthy muscle far beyond the gangrenous area. In my report in Progressive Medicine in 1899, I reported numerous cases of gas bacillus infection in which both gas and the bacilli were found far beyond the wound or the contused or necrotic tissue: On the chest wall, when the gas gangrene was below

41 Ibid., p. 38.

⁴⁰ British Medicine in the War, 1914-1917, p. 35.

the elbow; on the thigh, when the wound was below the knee. In a number of cases the patients recovered when the amputation was through this involved area, which was really a gas bacillus cellulitis, because, in addition to gas and the gas bacilli, there was distinct inflammatory reaction of the tissue apparently along lymphatics, subcutaneously, and in the fascia between muscles. These authors speak of a metastatic gas infection from bacilli in the blood, but from my experience recorded in 1899, I am confident that the gas bacilli may extend very much like any other organism along lymphatics and fascial planes from the infected wound.

When Welch and Flexner finished their investigation, they were of the opinion that the gas bacillus produced no toxin. Bull, of the Rockefeller Institute, was of the opinion that he discovered the toxin and antitoxin. Ford, the bacteriologist at Johns Hopkins, is very much interested whether there is a true toxemia in a pure gas-bacillus infection. Clinically, there is no question that in gas gangrene there is an intense toxemia and often patients die in twenty-four to forty-eight hours. But is this toxemia due to the gas bacillus, or to some other organisms, or to the toxins from the necrotic muscle? Under shock, I have called attention to the fact that many military surgeons describe a toxic shock observed in wounded in which the condition can only be explained by the rapid and massive absorption of toxins from dead muscle. Kenneth Taylor, the bacteriologist of the American Ambulance, whose work has been reviewed before in Progressive Medicine, is of the opinion that the infection with the Bacillus aërogenes capsulatus of Welch is essentially a disease of muscle, and other British observers agree with him. All seem to be of the opinion that gas bacillus infection rarely produces serious symptoms unless the muscles are involved up to necrosis. The muscles chiefly involved are those primarily contused. Crepitation and color change in the skin, often recognized as the first sign of the gas gangrene, are really comparatively late manifestations, as the primary seat of the infection is in the contused muscle.

Wallace contributes an article on the color changes seen in the skin and muscle in gas gangrene, with colored illustrations and microscopic reproductions of sections through infected muscle.

The color changes are quite characteristic, but in my experience the palpation of gas crepitation or emphysema and the appearance of gas bubbles in the discharge, or when one makes an incision, are more diagnostic.

McNee and Dunn⁴³ consider the method of spread of gas gangrene into

living tissue, with the following conclusions:

1. The rapidity of spread of gas gangrene into living voluntary muscle is so remarkable as to require explanation by a different process from that which governs ordinary septic invasion of tissue.

2. It is suggested that the facts are accounted for by the peculiar anatomical structure of muscular tissue. The sheaths enclosing the long individual fibers are so easily detachable as to form potential spaces

43 Ibid., p. 52.

⁴² British Medicine in the War, 1914-1917, p. 50.

into which the toxic material can readily pass causing necrosis of the fibers.

3. The early selective invasion of single muscle is consistent with the

above view.

Frankau, Drummond and Nelligan⁴⁴ report on the successful conservative treatment of early gas gangrene in limbs by the resection of infected muscle. They call attention to the fact already recorded that it is rare to meet this gangrene without muscle injury, that it is chiefly a disease of muscle, and when muscles are not involved the infections are light ones. In early stages the gas infection extends up and down, or rather in the direction of the muscle bundle. For this reason a single muscle may be involved, or a group. In the majority of cases, some of the muscles escape. The infection rarely passes from one muscle to another. For this reason, if one explores the wound, one as a rule can tell by the relation of a muscle or group of muscles to the wound, and by the change in color of the muscle, what muscle should be resected.

The authors have not established a uniform after-treatment, except that the wound should be left open, and there should be constant or intermittent irrigation. They suggest the Carrel-Dakin method, eusol,

saline, or hydrogen peroxide. They report 15 cases.

This impresses me as a very important contribution, because it describes an operative procedure to be performed not in the stage of contamination, but in the stage of infection, when there is clinical evidence of gas gangrene, not only in the color of the skin and the muscle, but in the presence of gas and the gas bacillus, and that the resection should be limited to involved muscle.

There is much in the literature on the treatment of wounds in the stage of contamination, but little on the operative treatment of wounds in the stage of infection. Carrel, in his book which I have reviewed, was rather adverse to any operation upon wounds which were phlegmonous, except the gas phlegmon, and here he advised free incision.

In my review in Progressive Medicine in 1899, I reported a good result from free incisions, open wounds and continuous bath treatment, but it never occurred to us at that time to excise infected muscle. Perhaps we could have saved some of our cases from amputation if this method had been developed. I get the impression that this is the most important contribution to the operative technic of gas gangrene.

Makins⁴⁵ also gives a short review of gas gangrene. He is interested in the undetermined question of whether there is a pure toxemia, as undoubtedly many patients die with this clinical picture. He is rather in favor that the process may be a true cellulitis. In my contribution in 1899, I called gas gangrene *emphysematous cellulitis*, and Welch, who reviewed my article later, seemed to agree with this term. However, the view of Kenneth Taylor which is accepted by most British authorities, that the disease is primary in the muscle, is gaining ground. The cellulitis may be secondary. Makins discusses another point of interest which is not cleared up. That is, hemolysis with jaundice observed in

45 Ibid., p. 61.

⁴⁴ British Medicine in the War, 1914-1917, p. 54

some cases. Makins does not mention excision of the mucsle as a method of treatment.

Treatment of Gas Gangrene by Mixed Serum. F. Ivens⁴⁶ gives a report on the preventive and curative treatment of gas gangrene by serum. He tested the curative serum prepared by Weinberg and Sequin, and also the preventive serum. From March to September, 1918, among 3600 wounded, three different sera were tried out. The injections were given within the first twenty-four hours. Ivens is of the opinion that he has averted anaphylactic phenomena by giving the serum in dilution and subcutaneously. Although gas gangrene was not eliminated in every case, it seemed to be to a large extent controlled. From his experience he is also of the opinion that these sera have a curative effect. The review does not mention Bull's work, and apparently Ivens did not try Bull's serum. The report is not convincing.

Tetanus. This wound infection stands alone as one the treatment of which was established before the war. The prevalence of tetanus in the early weeks of the war was either due to the failure to promptly give the prophylactic antitoxin or to provide the drug in the first-aid stations. Andrewes⁴⁷ tells us that not until early in 1916 was a committee appointed by the British Surgeon-General for the study of tetanus. This committee quickly demonstrated the importance of the prophylactic inoculation; it disseminated the knowledge of local tetanus and developed the details of the treatment of the fully developed disease tetanus. At the time of Andrewes's publication there was still considerable difference of opinion as to the best route for administering the antitoxin when the condition is local and when it is general, and in all

stages of the fully developed clinical picture.

48 Ibid., p. 62.

Makins⁴⁸ records tetanus as a terrible scourge in the autumn and early winter of 1914, but since then, due to the routine prophylactic injections, it has become an infrequent wound complication. But they have learned from bitter experience that the wounded must all be protected, even if there is but a slight abrasion or a vesication of a trench foot. Cases still occur, principally due to the late preventive injection among wounded who could not be collected in the zone of fire. They have also learned that after eight to ten days in those seriously wounded, tetanus may recur. For this reason repeated injections have been ordered at intervals of seven days. He records examples of delayed tetanus and local tetanus. Sometimes the symptoms of local tetanus are present in soldiers on duty in the trenches who have failed to report small abrasion or trench feet. The patients suffer from stiffess of a limb, or pain like sciatica, and if they do not receive the antitoxin, general symptoms develop later. According to Makins, treatment with carbolic acid or magnesium sulphate has failed, and the curative treatment of the fully developed disease by the antitoxin is by no means settled. The antitoxin can be administered subcutaneously as a preventive measure, but, when the symptoms of tetanus, either local or general, have developed, the anti-

<sup>British Med. Jour., 1918, No. 3016, p. 425.
British Medicine in the War, 1914–1917. p. 9.</sup>

toxin must be given intermuscularly. Makins's experience with the intravenous method has not been favorable and has been practically abandoned. The intraneural route is still under discussion, but is being largely employed.

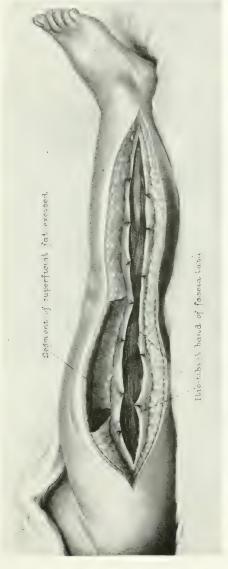


Fig. 17.—Technic of Kondolcon operation. Aponeurosis has been incised, separated from the muscle and sutured in such a way as to allow the subcutancous fat to drop on the muscles after the wound has been closed. A portion of subcutaneous fat has been removed. (Sistrunk.)

Recently, I have observed two cases of local and delayed tetanus. The symptoms, which were not grave, were not influenced by two intermuscular injections, but never reappeared after one intradural injection.

Bilharzia. When I was in Cairo, in 1893, I had the opportunity for the first time to study this infection, which is common in Egypt. But at that time little was being done, except the recognition of the infecting protozoön at autopsy. As England had many troops in Egypt, and as this disease was endemic there, Andrewes⁴⁹ tells us that a research committee was immediately appointed, headed by Leiper, to investigate the problem, which should undoubtedly have been investigated and solved long before. This committee stimulated by the war and the necessity of protecting large numbers of troops, successfully solved the main problem in a few months. They discovered that the intermediate host of the worm is a fresh-water molluse. The two species of bilharzia in Egypt have their distinct intermediate hosts. Demonstrating this, cheap and efficient means were soon found for rendering infected water safe in all military camps. For the first time the way was opened for the eradication of this endemic disease in Egypt and other countries.

Elephantiasis. Kondoleon Operation. W. E. Sistrunk,⁵⁰ from his experience in the Mayo clinic in Rochester, is very favorably impressed with this operation. The technic consists of a long incision along the inner and outer aspect of the upper or lower extremity and the removal of an area of edematous fat. The aponeurosis is incised, allowed to retract, or a portion is excised and then the aponeurosis is sutured to the

muscle, and the wound is closed without drainage (Fig. 17).

Nerve Injuries. Moynihan⁵¹ summarizes as follows: Nerve grafting is of little or no value. Nerve anastomosis is to be condemned. Turning down of flaps from nerves to bridge a wide gap is useless. The only method is to suture end to end. If this cannot be done, then transplant

tendon to overcome the loss of function.

The best time for nerve suture is when the first operation is performed and the wound excised and closed. The examination, therefore, for nerve injuries should be made at the time of the first intervention, and nerve suture should be a primary and not a secondary procedure. If this is impossible, and the wound has been left open, the nerve suture should be performed at the time of the secondary closure of the wound. Nevertheless, success has followed later, providing it is possible to make an end-to-end suture. Nerve suture should be done under the greatest antiseptic precautions, with the greatest gentleness, and the approximation should be perfect, without rotation of the nerve. The ends of the nerve should be divided before suture. The suture should be made with fine catgut.

Mechanical Treatment of Peripheral Nerve Injuries. Stookey⁵² emphasizes the importance of mechanical treatment until nerve function is restored, or until tendon transplantation has made the best possible restoration of function. The support of the paralyzed group of muscles, especially some apparatus which prevents overextension of these muscles, was especially emphasized by Jones, as reviewed in previous numbers of Progressive Medicine. In spite of this, in many cases the mechanical treatment after peripheral nerve injury is neglected. Stookey illustrates various types of apparatus for the upper

⁴⁹ British Medicine in the War, 1914-1917, p. 9.

Surg., Gynec. and Obst., 1918, xxvi, 388.
 Ibid., 1917, xxv, 595.
 Ibid., 1918, xxvii, 510.

and lower extremity, and the various measures in the mechanical treatment, practically all of which were reviewed when Jones's article was discussed.

Nerve Transplantation. Mackenzie⁵³ reported his first case before the American Surgical Association in 1909. The operation was done in 1908. He resected a fibro-myxo-spindle-cell sarcoma with a large piece of the sciatic nerve and gapped the defect by nerve plasty from the sciatic and its branches (Fig. 18). There has been no recurrence of the disease, and function is largely restored. The pathology of this case was fully described in Progressive Medicine, December, 1909, p. 207. This is one of the most successful examples of nerve plasty in the literature.

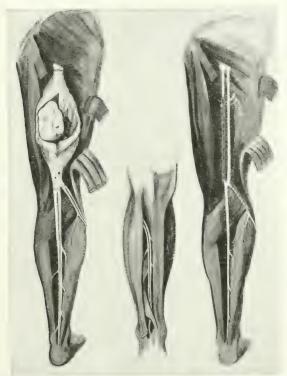


Fig. 18.—Showing the position of the tumor, the part resected, method of splitting the internal and external popliteal nerves, method of bridging the gap, and scheme of suturing peripheral flaps in muscular bed. (Mackenzie.)

Mackenzie reports other cases, and in his conclusion favors nerve flap, either central, peripheral or both, to fill the gap after the resection of nerves. Few surgeons have been as successful as Mackenzie with this form of nerve gapping.

The best recent experimental work on the surgical pathology of peripheral nerves is by S. M. Cone.⁵⁴ This research was done in Liverpool,

⁵³ Surg., Gynec. and Obst., 1918, xxvii, 353. ⁵⁴ British Jour. of Surg., 1918, v, 524; Abstract, Surg., Gynec. and Obst., 1918, xxvii, p. 324.

England, in the clinic of Colonel Robert Jones. It is a most valuable contribution to the gross and histological changes after nerve injury and suture. He had more than 200 cases for investigation, and, in addition,

did considerable experimental work.

Nerves are ready to unite at both ends before the eighth month after injury. The nerve bulb or the cylindrical enlargement shows the most prolific growth of nerve tissue. Fully formed nerves are present in both the proximal and distal ends. Apparently, Cone has proved this, although it was questioned before by many investigators. He has demonstrated there the axis-cylinders. There is no question, therefore, that regeneration occurs in the distal end of a divided nerve, but nerves grow best from the proximal end. Cone has demonstrated four methods of connecting the distal and central fragment in such a way that the embryonal nerves are given the best opportunity to mature:

1. By neighboring nerves torn at the time of the original injury.

2. By a strand of undamaged overlooked nerve still connecting the two ends.

3. By nerve fibers which have worked their way through the scar.

4. By adhesions carrying the nerve around and bridging the scar.

Cone has demonstrated that nerves grow well in granulation tissue, as they grow well along bloodvessels. They grow in fascia better than in muscle and along another nerve. Cone is of the opinion that the sear between divided nerve ends differs little from other scar tissue, except that it seldom becomes sclerotic. Nerves find difficulty in passing through any dense tissue. They are invariably found in painful scars.

One interested in nerve surgery should read Cone's communication

in the original.

Wounds of Bloodvessels. I have covered the literature of this subject pretty extensively in previous numbers of Progressive Medicine. In the beginning of the war there were many contributions, and the majority were interested in end-to-end suture, restoration of the continuity of the injured vessel by transplantation, lateral suture of injured vessels or covering the lateral opening with a facial transplant. Later articles based on larger experience seem to indicate that the method of choice was ligature of the vessel above and below the injury, or the aneurysm.

Bowlby and Wallace also call attention to this. They write that surgeons knowing that they would be dealing with healthy vessels above and below the injury or aneurysm looked forward to many opportunities for arterial suture. But these opportunities proved to be futile. Lateral suture of vein and artery has been done in a fair number of cases. In two instances a closure of a lateral rent in the vena cava was done. End-to-end anastomosis of arteries has rarely been done, and, when performed, was seldom successful. In fact, injuries to arteries are comparatively rare. In the figures which I gave on page 220 there are recorded 277 ligatures of arteries among 4554 wounds. Among these there are only 2 of the subclavian artery, 2 of the external iliac, 51 of the femoral and 31 of the popliteal. All the remainder were smaller arteries.

[&]quot; British Medicine in the War, 1914-1917, p. 43.

They mention Tuffier's tubes as having been employed successfully in a few cases. It has also been noted that in this war, after vessel injury with gangrene, there is rarely a distinct line of demarcation. For this reason the plane of amputation must be chosen by studying carefully the color of the skin, its coldness, and by making incision to demonstrate capillary circulation. The authors also call attention that the point of application of a ligature apparently safe, as based on observation in civil practice, is not always the safe point in gunshot wounds. This is espe-

cially true of injuries of the popliteal artery and its branches.

Makins⁵⁶ observes that injuries to large vessels have been conspicuous by their absence. The most common lesion of bloodyessels is a contusion, which later leads to secondary hemorrhage or embolism. The latter was especially common in contusion of the carotid. He is also of the opinion that contusion or embolism was responsible for a large number of cases of gangrene of the limb not associated with infection, but, of course, this was difficult to prove, as there was rarely time for a careful dissection. In a number of instances the arterial wound was plugged by a foreign body, and when this was removed there was immediate hemorrhage, or, in some cases, secondary hemorrhage. He has employed the stethoscope for diagnosis of arterial lesions, based upon the auscultation of a systolic bruit which, in the opinion of this author, is pathognomonic. This may be present and indicate the injury when a distal arterial pulse is present, suggestive of an uninjured vessel. This systolic bruit is present in both arterial and arteriovenous injuries. When there is a distal pulse, the blood-pressure is normal on the lower side. Many of the cases of arterial injury have been transported to England without either the complication of hemorrhage or gangrene. Suppuration of an aneurysm has been a rare complication. On the whole, the treatment has consisted of ligature above and below, both for arterial and arteriovenous wounds, and for aneurysm and aneurysmal varices. This viewpoint is entirely different from our experience, based on civil practice.

In some cases, Tuffier's tubes have been employed. Very few cases

of end-to-end and lateral anastomosis are reported.

Makins reports one very interesting observation of Captain Cowell. The patient had a wound of the thigh; the foot was cold; there was no pulsation in the tibial vessels. On examining the wound, he found a thrombus in the femoral artery just above the apex of Scarpa's triangle, pulsation above, but none in Hunter's canal. This surgeon incised the femoral artery for one-third of an inch, squeezed out a thrombus and then sutured the wound. Pulsation returned in Hunter's canal, but not in the tibial vessels. Later, a secondary thrombus formed. He does not mention whether gangrene was prevented.

Treatment of Aneurysm by Proximal Occlusion with an Autoplastic Facial Flap. Jones and Waits⁵⁷ report a case in which Halsted's method of occlusion of the artery was followed, but a fascial flap was employed instead of a metal band. Fig. 19 illustrates the aneurysm and the method of applying the fascial autoplastic band.

British Medicine in the War, 1914–1917, p. 63.
 Surg., Gynec. and Obst., 1917, xxv, 689.

The patient, a colored laborer, had observed a swelling of the right groin for two months. There was no history of injury or wound. The swelling pulsated. There is no note on a Wassermann, but there were skin lesions of syphilis. He was first given antisyphilitic treatment. The operation was performed in October, 1914. The fascial flap was taken largely from Poupart's ligament. Following the operation, there was no pulsation in the aneurysm and the swelling rapidly disappeared. In a month the patient was practically well. The pulsation could be felt in the femoral artery at a point 5 cm. below the aneurysm.



Fig. 19. Drawing showing partial occlusion of primitive femoral artery with band of fascia from Poupart's ligament. (Jones and Waits.)

In the technic of the operation, the fascial band was tightened until pulsation was obliterated in the vessel below and in the aneurysm. It therefore was not a partial occlusion, but practically a ligation. They

then describe their experiments on dogs.

Joint Injuries. Bowlby and Wallace write that a great change for the better has taken place in the results after the treatment of wounded joints. Among 4554 wounds subjected to operation, 244 were confined to joints, and, of these, 183 were of the knee-joint. In the early period of the war perforating wounds of the knee-joint were left alone. From time to time the fluid was tested by aspiration. The larger wounds, opening and exposing the synovial sac, were drained into the joint cavity. The results were bad. The first change which recorded improvement was to abandon the intra-articular drain. Halsted called attention to the danger of draining joints, especially with gauze, before 1890. I know he taught me never to do it when I came to his clinic in 1892, and I have referred to this again and again in Progressive Medicine.

⁵⁸ British Medicine in the War, 1914–1917, p. 43.

The next improvement, in the technic of treating a joint wound, was the complete excision and closure of the wound. The authors record how seldom infection followed, even when fragments of shell and particles of clothing were removed from the joint. Apparently, the most important procedure is the excision of the wound. In Progressive Medicine for 1899, I reported a case of bullet wound of the knee-joint for which Dr. Halsted operated within twelve hours after the injury. At the time of operation there was gas in the joint, and Welch found the gas bacillus. However, the lesion was in the stage of contamination and not of infection. The bullet was removed, but the wound was not widely excised. The wound was thoroughly irrigated with bichloride and closed. However, the infection continued, and the limb had to be amputated above the knee. The patient recovered.

In some instances the complete excision of the wound may necessitate a plastic operation to close the defect. Experience has also shown that if, after operation, there is some local and general evidence of infection, it is safer to delay reopening of the wound, because, in many instances, the infection subsides. Even when the joint wound is complicated with fracture, it is often possible to excise the wound and close. When the patella is fractured it is often necessary to remove some of the fragments. When the knee-joint injury is associated with fracture of the tibia, the lesion is more serious than when the femur is involved. When the fracture of the femur or tibia is comminuted and the wound dirty, it is best to perform primary resection, leaving the wound open for the Carrel treatment.

The reason that there are so many recorded primary injuries of the knee-joint is due to the fact that when other joints are opened there is usually so much accompanying damage to soft parts and bone, that the method of complete excision and closure is less frequently possible. The rule already stated for primary excision of the knee-joint holds for other joints, and, in the majority of cases, primary excision must be practised. After operation, the most important feature is fixation.

Makins⁵⁹ records that the experience of wounds of joints in previous wars helped them very little in this war. The older wound was that from a rifle bullet, perforating, seldom associated with much contusion or the presence of foreign bodies. The wounds of joints in the present war are lacerated, contused, grossly contaminated, filled with foreign bodies, complicated with fracture. The wound of the soft parts about the joint is more difficult to handle than that of the synovial sac. Drainage is not only useless, but harmful. Results depend upon early treatment, followed by complete rest, with immobilization and extension. He also cautions surgeons, especially in the hospitals farther back, not to reopen wounds that have been properly treated by excision and closure because there is synovial effusion, local redness, tenderness and swelling. This is the usual course, and, if rest, extension and immobilization are maintained, the inflammatory reaction will subside. To unnecessarily open such a wound would destroy the efficacy of the early radical excision

⁵⁹ British Medicine in the War, 1914-1917, p. 67.

and closure. Of course, such cases can be restudied with the roentgen rays to demonstrate whether, at the primary operation, all the foreign bodies had been removed. If the foreign body is a rifle bullet, its immediate removal is not indicated unless the local signs of infection demand it. Even if there is still present a small fragment embedded in the articular surfaces, it should be left alone. Again, if the fragment is larger, it may be outside the joint cavity. There is no doubt that such wounded joints, when they are transported to the rear, should be accompanied by a good record of what was found and done. Again, one must remember that a rough transport will aggravate the local condition and this will rapidly improve when complete rest is again maintained. In other instances the infection is outside the joint—periarticular—for this reason it is the safer plan for surgeons in the base hospitals to watch such patients whose joint wounds have been excised and closed at a forward station a day or two before reoperating. There is no objection to a bacteriological examination of the fluid aspirated from the joint capsule. Makins agrees with Bowlby and Wallace and other authorities that in the majority of cases the treatment of choice is the early excision and closure.

When the joint wound is suppurating, excision and closure are out of the question. The best treatment is that of Carrel-Dakin for an open wound, and one must constantly bear in mind, look for, and drain intra- and periarticular pockets of pus. These are observed most frequently on either side of the crucial ligaments and posterior, in the popliteal space, about the lateral aspects of the condyles. Hence, posterior drainage is not as good as posteriolateral drainage. In the later stage of granulation, Makins advocates the Rutherford-Morrison method, which consists of excision of the granulation tissue, filling the wound with bismuth-iodoform-paraffin and closure.

Makins records excellent results even in complications with fracture. He seems to be of the opinion that knee-joint injury complicated with comminuted fracture of the bone demands amputation, while other surgeons prefer resection.

One must always remember that if, after a prolonged treatment involving great risks, the best hoped-for result is a stiff knee, the functional result between a stiff knee and an artificial limb does not justify running the risk nor the delay. In the upper extremity it is an entirely different matter. Everything should be done to save every particle of the extremity. Stiff joints can later probably be made movable.

Makins discusses the early excision, as advocated by Bowlby and Wallace, that is, at the time of the primary operation at the casualty station. Apparently, this is the time to perform excision if it can be done. Intermediate excision is an operation about which Makins has the gravest doubt. By this he means an excision during the stage of infection. One gets the impression, if the knee-joint cannot be saved by the open wound and the Carrel-Dakin treatment, it is better to amputate, but I do not believe this rule can be applied to the other joints. Of course, late excision for the ankylosed joint is a procedure well established in peace surgery.

ARTHROPLASTY FOR NEW JOINT FORMATION. Phemister and Miller give a very interesting experimental study from the department of

surgery of Rush Medical College, with excellent illustrations.

Ankylosis following arthritis of one or more joints is, as a rule, due to late or faulty treatment. Unfortunately, it occurs frequently, and for this reason any method which will improve our technic of restoring joint motion will be welcomed. Apparently, the total transplantation of joints has failed as a permanent cure. The introduction of foreign membranes is not always successful. Fascia flaps or transplanted fascia have yielded better results.

This piece of experimental work goes into the details of preparing the joint for the pedunculated or free transplants, and it is their opinion that the most important steps are the construction of a well-fitting new

joint, the excision of the scar tissue and the after-treatment.

The authors also call attention to the well-known, but often overlooked difficulties due to the atrophy of the disused muscle and the adherent tendons. In my experience it has been more difficult in many cases to restore the diseased muscle to normal function, than to get joint motion. In every instance the treatment is prolonged, requires constant super-

vision by the surgeon, and the cooperation of the patient.

Fractures in War.—I have covered this subject pretty completely in the previous numbers of Progressive Medicine, and have pictured the various splints and suspension apparatus employed in the hospitals in France. The problem is to retain the broken bone in place while the huge wound is healing and the fracture ossifying. The prevailing principle of all the splints is extension in continuity so arranged that the wound can be redressed without discomfort or disturbing the fracture. There is no more difficult wound to treat than a compound fracture from shell or shrapnel. If these wounds can be excised and closed at the primary treatment the subsequent treatment will be simplified. Among 4554 gunshot wounds subjected to operation in a casualty clearing station, about 25 per cent. (1403) were fractures. Of these, over 600 were of the lower extremity.

Bowlby and Wallace⁶¹ give a brief summary of this subject. They state that the tendency is to trust to extension and to abandon all constricting splints. The splint of choice for a first dressing, and even for subsequent treatment for fractures of the upper and lower extremity, is the one that I have mentioned in previous numbers of Progressive Medicine—the Thomas splint (Fig. 20). Every military and civil surgeon should be familiar with the application of this splint. In letters from medical graduates of the Johns Hopkins with experience on the firing line in France, I repeatedly hear of this splint as a life-saving appliance and with what rapidity soldiers in the Medical Corps learn

to apply it.

Bowlby and Wallace divide the treatment of a compound fracture into

two parts: The cleansing of the wound and the reduction and fixation of the fracture. Total immediate reduction should be aimed at, if it does

Surg., Gynec. and Obst., 1918, xxvi, 406.
 British Medicine in the War, 1914–1917, p. 45.

not interfere with the primary treatment of the wound. When the fracture occupies the upper portion of the thigh, the Thomas splint cannot be used. Then one should employ a Liston splint or the abduction frame of Jones. If the wound associated with a fracture cannot be excised, it should be thoroughly cleansed at the primary operation.

Makins⁶² calls attention to the unpreparedness of the British Medical Corps for treatment of large numbers of fractures at the front. The splints were neither sufficient in numbers nor of the proper kind. Apparently, it was Colonel Robert Jones, the British orthopedic surgeon, who demonstrated the enormous advantages of the Thomas splint, and who made other modifications of splints for the primary treatment and transportation. Makins then discusses the primary treatment of the soft-part wound. We all are familiar with the disastrous results of the first years of the war, during which time the primary treatment was delayed for the base hospital, or, if performed early, was incomplete, or, if done well, was improperly dressed and transported. In addition to

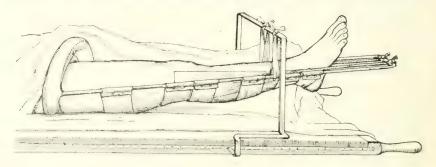


Fig. 20.—Fractured femur, with Thomas's splint and stretcher suspension bar. (Bowlby and Wallace.)

the splints to be employed with the primary dressing and transportation, there rapidly developed many ingenious methods of overhead suspension and traction, devised and popularized by Blake in the American Ambulance. These have already been discussed and illustrated in previous numbers of Progressive Medicine. Makins seems to feel that the most conspicuous success in the treatment of the open wound of a compound fracture has been attained by the Carrel-Dakin method. Another difficult problem is, When should the piece of dead bone or sequestrum be removed? This apparently is largely a matter of surgical judgment and experience. No one seems to be able to give definite rules. When the Carrel-Dakin method is employed, one can be considerably guided by the cover-slip examination.

The treatment of osteomyelitis secondary to a compound fracture is a much more trying problem than the question as to when to remove the sequestrum. In some cases it is better to amputate and be done with it. However, I am personally convinced that with the Carrel-Dakin treatment properly employed, many limbs will be restored with good function

⁶² British Medicine in the War, 1914-1917, p. 64.

by conservative treatment. Makins writes, as most all other surgeons of military experience do, that the fixation of fragments by plates, screws or wire should be seldom resorted to in the primary treatment. But later, when the wound has become sterile, they may be employed with more safety. A number of hospitals have been established for the treatment of fracture cases alone, and this apparently has improved the results. In the treatment of these compound fractures not only the surgeon, but his entire personnel must be trained.

FRACTURE STRETCHER FOR COMBINED SUSPENSION AND TRACTION UNDER ROENTGEN-RAY CONTROL. Hawley⁶³ describes and pictures an apparatus which will be of the greatest value, because it will allow transportation of the patient in extension from bed to the roentgen-ray room.

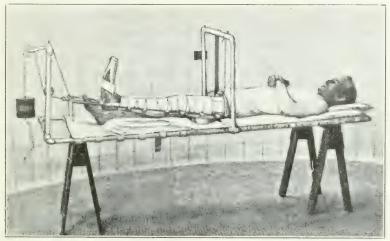


Fig. 21.—Frame used as bed or cot by resting it on supports. (Hawley.)

It is a Bradford frame to which are added various parts which allow extension of fractures of the upper and lower extremity. Fig. 21 shows the patient on such a frame in extension. This can be lifted from bed to carriage and the patient transported to the roentgen-ray room. One should turn to the original for the description of the details.

THE TREATMENT OF FRACTURES BY EXTENSION AND TRACTION. Blake and Bulkley⁶⁴ describe and illustrate the now well-known method of the treatment of various types of fractures by overhead extension. In my previous reviews on military surgery I have gone into this in great detail, and have given Major Blake the credit of developing the method in war surgery. But at that time I could not review any of his contributions, because the one published in 1916⁶⁵ was not accessible.

This recent article should be read in the original. Practically all the illustrations which appear have been reproduced in previous reviews in Progressive Medicine.

⁶³ Surg., Gynec. and Obst., 1918, xxvi, 339.

⁶⁵ Arch. de Méd. et Pharmac, Mil., Paris, 1916, lxvi, 289.

This method of treatment of fractures will undoubtedly become the routine method in civil hospitals in the future, and the mechanism of its application should be mastered by every surgeon. It allows the application of the Carrel-Dakin method of wound treatment and makes frequent dressings, which are essential, less painful. It renders the nursing problem less difficult and provides for the chief, and perhaps most essential, feature in the treatment of fractures—the maintenance of extension in continuity with the least amount of fixation which interferes with muscle contraction and joint motion. It is far simpler than the application of plaster fixation.

Military Orthopedics. Mackenzie gives a short review of the British military hospital and the methods employed in reconstruction orthopedics. But, as I have reviewed Colonel Jones's book on military orthopedics in the December, 1917, number of Progressive Medicine, there is little more to be said on this subject, and, in fact, Mackenzie quotes Jones throughout the article, reproducing the illustrations from

his book.

There seems no doubt that the majority of the reconstruction of the wounded should come within the control of trained orthopedic surgeons, and the British Government has apparently recognized this and has appointed Colonel Jones Inspector-General of Military Orthopedics.

Vocational education can begin with curative orthopedics and then continue after the work of the orthopedic surgeon has been finished. It is fortunate for our wounded soldiers that General Gorgas almost immediately recognized the importance of orthopedic surgery and established in his office, under the charge of Colonel Brackett, of Boston, an orthopedic department. This department has splendidly recruited and prepared its personnel, and I am confident that when the end-results of our reconstruction are known, this foresight on the part of General Gorgas will be recognized as one of the most valuable efforts for preparedness in the Medical Corps of the Army.

According to the British Army Council, military orthopedic cases are

including the following list:

(a) Derangements and disability of joints; simple and grave, including

ankylosis.

 (\vec{b}) Deformities and disabilities of feet, such as hallux rigidus, hallux valgus, hammer-toes, metatarsalgias, painful heel, flat- and claw-feet.

(c) Malunited and ununited fractures.

(d) Injuries to ligaments, muscles and tendons.

(c) Cases requiring tendon transplantation and other treatment for irreparable destruction of nerves.

(f) Nerve injuries complicated by fracture and stiffness of joints.

(g) Certain complicated gunshot injuries to joints.

(h) Cases requiring surgical appliances.

I do not understand why they do not specificially include amputation stumps and artificial limbs unless artificial limbs are included under surgical appliances. When the war ends there will be less surgery for the general surgeon and more for the trained orthopedic surgeon.

In the United Kingdom there are apparently thirteen command depots for the treatment of orthopedic cases, of a total capacity of 45,577 beds. In connection with each orthopedic center which provides not only for operations, but for all methods of treatment, there are provisions for curative industries and vocational training.

In addition to the command depots, there are permanent orthopedic hospitals throughout the United Kingdom. In England, there is also a special hospital for limbless soldiers. On page 87 of *British Medicine in War*, 1914–1917, there is an excellent description of the Williams Welsh arm, a prothesis which allows the armless soldier to work at various trades.

The literature on the protheses for the armless demonstrates that the perfection of its development is almost as complete as to function as the artificial limb for the lower extremity.

Shoes and the Care of the Feet. In the most recent number of the *Military Surgeon*, 1918, xliii, p. 557, there is a summary of this subject under Comment and Criticism. It therefore should represent the experience and views of the Medical Department up to date. According to this criticism, the military surgeon has always advocated periodical physical examinations not only by the line, but by medical, officers. This is also a requirement of the army regulations. The feet of a soldier should receive the same minute inspection as his rifle. Lieutenant-Colonel Johnson gives his experience with troops in the trenches during which time the minute inspection and care of 4000 men was so effective that within six weeks, but one soldier with foot trouble was sent to the hospital.

When this regiment began its field training in France, the men were equipped with the garrison or field shoe and were wearing a thin, closefitting sock. When the weather changed to wet and cold, the men changed to heavier socks which, in the majority of cases, were too small and too short. This led to compression and interference with circulation evidenced by areas of hyperemia and paresthesia, by the soldiers complaining of sensation of stinging, burning and itching. In many cases the suffering was not only marked during the day, but continued at night and prevented sleep. Later there developed chilblains and frost-bites, then complications, such as blisters and local areas of gangrene. In many instances the shoes were too short when the heavy sock was put on: this led to jammed joints with pain in the arch of the foot, extending to the muscles of the calf and thigh. The general discomfort led to muscle strain. During this period many soldiers were on sick report in quarters or hospitals from one to six weeks, with a foot lesion distinctly preventable. Line and medical officers must remember that in fitting the foot with a shoe, the latter should be much larger than usual in civil life. When the soldier carries his full equipment the foot elongates and broadens. Provision must be made for this, and for the change from thin to thick socks, and from the swelling which accompanies wetting of the feet. In view of this experience, the examination of soldiers' feet and

the refitting of shoes had to be carried far beyond that provided by the regulations. The majority of the line officers needed specific instructions on shoe-fitting and the care of the men's feet, because it is impossible for the small medical personnel to get the best results without the constant and intelligent cooperation of the platoon commanders. The winter shoe must be much larger than the summer shoe, and it is a good plan when fitting the shoe to have the soldier wear two pairs of heavy socks. The width of one and one-half to two fingers should be allowed from the end of the great toe to the end of the shoe. These military officers found the Munson last most satisfactory if the shoe were properly fitted. The garrison shoe is too light at the top and not waterproof. The field shoe should be made with more depth over the toes to avoid compression. Reversing the leather allows the penetration of water, and the smooth surface within prevents the ventilation of the feet. Men who must stand for a long time in the cold in wet places should be provided with feltlined rubber boots similar to those worn by the lumber jacks in America. The soldier should be instructed and compelled to bathe the feet daily in cold water, dry them thoroughly, cover with foot powder and put on dry socks and shoes. On going to bed, if the feet are cold, the soldier should massage them with some animal oil, whale oil, lard or tallow. The soldier should always sleep in a dry pair of socks, and on arising in the morning the feet should be again dried and powdered and two pair of dry socks put on. The shoes should always be large enough. The soldier must be instructed and urged to report immediately to his commanding officer for reference to the medical officer, if he has any inconvenience whatever with his feet. It is the duty of the line officer to see that the soldiers are provided with all the proper means to wash, dry, powder and oil their feet, that they have a sufficient number of socks and shoes; each company should be provided with a drier for wet shoes and stockings.

The oiling of the shoe to make it water proof should not be overdone, for then it prevents proper ventilation, favors sweating, maceration and blistering of the skin. In cold weather the excessive oil freezes and stiffens the leather. The shoe should have a thick sole and be hobnailed, but as hobnails act as conductors of cold, the author suggests that when the shoe is resoled there should be inserted between the old and new sole oiled paper, silk or belting. The British field shoe is so provided. Neolin has also been a good material. In the new shoes to be constructed the authorities recommend that the smooth side of the leather be out; it should have a Blucher top, a Munson last, a deep wide toe area, a leather insole, a Neolin sole, or some other equally good material, and that the hob-nails should be fewer in number, and that the sole should be heavy.

Reconstruction. In the Surgeon-General's Office there is a separate department which concerns itself entirely with preparedness for the reconstruction of disabled soldiers and sailors. There is also a Federal Board for vocational education. On this board are three members of the cabinet—the Secretaries of Agriculture, Commerce and Labor. The Commissioner of Education is a member of this board. The United

States Government has attempted to collect, correlate and assimilate the experience of all the countries at war, with the reconstruction and vocational reëducation of their disabled soldiers and sailors. I have before me Bulletin No. 15, Reëducation Series No. 3, printed by the Washington Printing Office and issued in May, 1918. It is edited by Douglas C. McMurtrie. It is a pamphlet of 318 pages and contains numerous illustrations. The bibliography covers 50 pages in fine print.

This book is accessible to everyone. Much of the most interesting material has been put in motion-picture stories for the education of the profession and the public. It represents one of the many efforts on the part of our Government to solve this problem. It has for its object to ultimately make the disabled heroes of this war independent workers and happy members of society in the peace that they have won for the world.

The reconstruction department of the Surgeon-General's Office publishes a little pamphlet called Carry On and the Red Cross Society in its Journal prints many articles on various phases of the question.

There is another little pamphlet issued by the Government entitled Uncle Sam's Insurance for Soldiers and Sailors: Answers to Questions You Will Ask. This pamphlet can be obtained by writing to the Treasury Department, giving the title and asking for Official Bulletin, No. 4.

You can get Carry On by addressing the Surgeon-General's Office. Bulletin No. 15, on the Evolution of the National System of Vocational Reëducation for Disabled Soldiers and Sailors, can be obtained by writing your Congressman or the Government Printing Office, Washington,

The Red Cross Society will mail on request its publications and

pamphlets.

Undoubtedly, all members of the medical profession and the Medical Corps of the Army who are connected with any army hospital will be supplied with this literature, but every industrial physician and surgeon in this country should have this pamphlet. The problems are very similar in industry, and previous to this war they had sadly been neglected.

Reconstruction not only has to do with wounds of tissues and organs, but with physical sequelæ of infection and disease, and with pathological mental conditions arising as a consequence of the war. Reconstruction begins with the onset of the wound or the disease. The first problem is the healing of the wound and the cure of the disease, whether

mental or physical.

In all of our training camps many applicants and registrants were admitted to the army who at their examination did not come up to the full standards, physical and mental, which would allow immediate full military training, and many soldiers and sailors in training broke down, and there were many convalescents from the infectious diseases in the base hospitals.

Many of these convalescents and apparently defective men were retained in camp and a systematic and prolonged attempt was made to render them fit for full or limited military service. This special training and treatment was either carried on in the convalescent section of the base hospitals or in depot brigades. The majority of these soldiers were suffering with some foot defect. Another large group were cardiovascular defectives, another mental deficients.

There was also a very large group of men who required prolonged and systematic treatment for syphilis and gonorrhea before they could

be rendered fit to fight.

Before a sailor was sent afloat and before a soldier was transported to France, there was complete mental and physical examination, and all those who did not come within the standards of acceptance were left behind in the training camps. When the personnel of the first training camps were evacuated to France large numbers were left behind either ill in the hospitals, or convalescent, or in the so-called training depot brigades. At the present time we do not know the actual salvage from this large group.

We know, however, that France and England were comparatively successful in the rehabilitation of soldiers similarly afflicted, and the

salvage was large—a very important saving in man power.

When the army reached France and went into training there, long before there were any disabled from wounds, a similar group of men disabled by disease or training began to multiply and had to be taken care of, with the object of making them again fit to fight. Then came the third group of those disabled by wounds received on the firing line.

When this Government has accepted a soldier or sailor and enlisted him into the army, navy or marine corps, and he breaks down from training or disease, or is disabled by wounds, the Government holds itself responsible and has endeavored in every way to provide not only for his immediate care and cure, but proposes to look after him and give him the benefit of all the agencies of modern medicine and surgery, and at the same time, if necessary, to give him an education in some field of activity which his previous education or occupation considered with his present disability will allow him to be trained for. At the same time the Government proposes to amply provide for those whose disability renders reëducation and reconstruction either totally or completely impossible

It is by no means a simple problem. But we can be quite sure that we will be able to equal the results so far obtained by other countries and, perhaps, on account of our greater financial strength and the splendid coöperation promised by labor and employers, to far surpass the results so far obtained. This country is fortunate in having a large, well-trained medical profession, splendid and numerous civil and military hospitals and large numbers of intelligent and educated men and women who are willing to devote their lives to the educational problem. Judging from the character and intelligence of our soldiers and sailors, and from the spirit shown in entering this war, one gets the impressin that all who have to do with reconstruction and reëducation will not be handicapped by lack of coöperation on the part of the disabled men themselves. However, the entire country needs information on what the Government

is doing and some very important instruction as to their attitude toward the returning disabled men to whom we owe so much.

It should be the duty of every member of the medical profession to get and read the literature I have quoted and help the Governmental officials in disseminating this knowledge among the general public.

Everyone knows that it would be a great mistake to return to the old pension system and everyone should help to prevent the older methods of politics from rendering the efforts of the Government futile.

The Hon. Charles E. Hughes, in a recent address published in *Science*, expresses the opinion that when the Government controls great industries, as it had to do during this war, it should give up this control when peace is declared, because experience has demonstrated that great business enterprises controlled by the Government are less efficient than when under private management. Granting that this may be true in some cases, it does not mean that it is true in all. So far as I can learn, all of those who have had experience in this great business of reconstruction and vocational reëducation are of the opinion that it should be under the absolute control of the Government from the beginning to the end. Otherwise it will be a failure. Government control and supervision does not mean that any established organization, old or new society, cannot be utilized in the performance of this Governmental work and duty, and no one so far has suggested that any other agency outside of the Government could accomplish the same results with any more efficiency, or at a less cost to the country.

Meyers⁶⁷ describes the physical and mental training of convalescents at the base hospital at Camp Taylor, Ky. It is called the Convalescent Camp, and consists of twelve barracks, with the usual outbuildings and accommodation for seventy-six patients. There is also a large screened porch for open-air treatment. This convalescent camp is connected by corridor with the base hospital, and near it the Red Cross and Y. M. C. A. have erected recreation buildings. This camp is for the treatment of convalescent soldiers, who are looked after in that period when they are too well to remain in the hospital and yet not sufficiently recovered to return to full duty. Medical and surgical treatment can be carried on at the same time as modified military training and other forms of military instruction.

Many of the duties and courses of instruction were made voluntary. Over 90 per cent. volunteered. Military discipline was maintained. Experience with this method showed that the period of convalescence was shortened, the morale of the soldier was improved and many received valuable information during this period of partial disability.

I was much interested in this report of Captain Meyers, because, when I made a tour of the different camps in December, 1917, I urgently recommended to the Surgeon-General the immediate erection and formation of what I called the convalescent section of the base hospital. In the majority of the camps at that time there was no provision for the

convalescing soldier, or those who, for one reason or another, were not fit for full military training. This led to loss of time, to idleness and to a decrease in the morale of this group of soldiers. There was ample provision for those sick enough to be in a base hospital and those well enough for full training, but there had been made no adequate provision for this third group of convalescents and those partially disabled for one cause or another, and this group grew larger and larger.

Major Lovett, of Boston, 68 in his summary, states that the difficulty of presenting the question of reconstruction must be evident. It is a new subject, practically dating from 1915. There are many disputed points and unsettled problems. It should not be looked upon as a new form of charity, but a plan to discharge a pressing obligation. Success depends upon sound public sentiment; emotionalism has no place in the scheme. The Government, the public, the manufacturer, the labor union and the

medical profession must cooperate in solving the problem.

Loyett gives the following figures. For every 1,000,000 men sent overseas, 100,000 will return unfit for military service. Of these, only 20,000 will require complete or partial vocational reëducation. From the medical standpoint, about 75 per cent, should belong to the orthopedic department of the Medical Corps; about 13 per cent. blind or deaf; about 23 per cent. diseases of chest, heart and rheumatism, and about 4 per cent. nervous diseases. One of the largest numbers will be soldiers requiring artificial limbs.

Reconstruction can first be divided into three groups: medical or surgical attention, therapeutic measures, which include curative workshops, massage, gymnastics, and so forth, and vocational training, which

includes placement and follow-up.

TUMORS.

In the surgical pathological laboratory the material is first classified into the following main divisions:

I. Injuries. This includes both accidental and operative wounds and the general problems of shock, anesthesia, preoperative and post-

operative complications and treatment.

II. Infections and Infected Wounds. This includes the records of such infections as furuncle, carbuncle, anthrax, actinomycosis, tetanus, and gas gangrene; the surgical pathology and bacteriology of all infected wounds and the general results of infection, such as bacteremia, septicemia, toxemia, pyemia, etc.

III. Tumors. This is subdivided into three main groups:

(a) Benign and malignant epithelial tumors of the skin and mucous membrane of the oral cavity.

(b) Benign and malignant pigmented moles.

(c) Benign and malignant connective-tissue tumors of the skin and soft parts.

⁶⁸ Surg., Gynec. and Obst., 1918, xxvii. 169.

IV. Lesions of Special Tissue, which are subdivided as follows:

(a) Skin and subcutaneous tissue.

- (b) Tendons.
- (c) Bursæ.
- (d) Joints.
- (e) Bone.
- (f) Nerves.
- (g) Muscle.
- (h) Blood.
- (i) Bloodvessels and lymph vessels.
- V. Lesions of Special Glands.
 - (a) Salivary glands.
 - (b) Breast.
 - (c) Thyroid.
 - (d) Lymph glands.
- VI. Lesions of Special Regions.
 - (a) Head.
 - (b) Eye.
 - (c) Ear.
 - (d) Jaw, including nose and sinuses.
 - (e) Neck.
 - (f) Chest.
 - (g) Abdomen.
 - (h) Kidney and genito-urinary organs.
 - (i) Pelvic organs of the female.

(j) Pelvic organs and special pathological lesions of pregnancy.

This classification has been adopted in order that the records, gross material and sections may be conveniently arranged to allow the continuous investigation of pathological conditions in which the problems of diagnosis and treatment are, to a large extent, identical. There is little to be learned by studying together tumors of the breast and of the stomach. All lesions of the breast can be placed together, but lesions of the stomach, from a clinical standpoint of diagnosis, offer problems in abdominal surgery.

As our material of benign and malignant tumors, of epithelial and connective-tissue origin, accumulated, I became impressed with the importance of this classification and with the later subdivisions.

In the first place, tumors arising in the skin and subcutaneous tissue and in the oral cavity are quickly recognized by the individual, because the local lesion can be seen or felt. The records soon demonstrated that the preëxisting lesion was remembered distinctly by the patient, either as a congenital tumor, such as a mole, wart or nevus, or as a palpable subcutaneous nodule, or as an area of chronic irritation, such as an area of eczema, keratosis, ulcer, sinus or leucoplakia. The importance of these facts has been recently more clearly appreciated by those interested in the cancer problem in the human being. We now have the evidence that cancer of the skin and mucous membranes of the oral cavity never arises in a healthy spot, but that the patient is always aware, by sight or touch, of a preëxisting local area entirely different from the normal

skin or mucous membrane. If they are informed that such a local area may become cancer, and that at the present time, in the vast majority of cases, no one can tell when or why such a local area changes its local cellular growth from benign to malignant, then the individual will have the proper mental conception and receive the further information that this spot of changed skin or mucous membrane should either be returned to normal by some treatment or radically removed with the knife or cautery. In the great majority of cases, complete excision with the knife is the method of choice.

Our records, now numbering thousands of cases, seem to show that if an individual dies of a malignant tumor of the skin or mucous membrane of the oral cavity, the death is due either to the ignorance of the individual, or, if he is informed, to his neglect to act, or to the improper or incomplete treatment or radical removal of the primary local lesion

in its earlier stage.

When the tumor is situated beneath the skin the patient is always aware of a palpable nodule or mass. If he has the same information that such a little subcutaneous nodule may later become a malignant tumor, he will more readily understand and accept the suggestion that the feeling of a little subcutaneous tumor indicates an immediate examination by one competent to recognize its nature, and, in the great majority of cases, its complete removal. There seems no doubt that the chief hope of reducing the mortality from cancer is by the education of the public on these facts, and the education of the medical profession to institute the proper treatment when aid is sought in this early stage.

It is undoubtedly true that complete excision with the neighboring lymphatic glands accomplishes a cure even after the local growth has become malignant and even after the neighboring glands have become involved. But the relative number of such cures is small, even after

the most radical operations by the most expert surgeons.

The chief cause of death after the proper removal of a sarcoma is metastasis to the lungs, and not local recurrence. The chief cause of failure to cure after the most radical operation for carcinoma is local or regionary recurrence, due to the fact that the carcinoma has infiltrated, either visibly or microscopically, beyond the possibility of excision with the knife or cautery.

It is true that surgeons have still much to learn in regard to the extent of the local removal of the malignant tumor, and as to when and how to remove the neighboring lymphatic glands. However, the evidence seems to prove clearly that no matter how proficient the entire surgical profession may become in this operative detail, it will have a relatively

small effect on the total mortality from cancer.

Epithelial Tumors of the Upper Extremity. Fig. 22 pictures an indurated ulcer at the junction of the ring finger and the palm of the hand. The cancer had infiltrated along the lymphatics accompanying the ulnar and brachial arteries to a mass in the axilla, so that it was necessary to amputate the arm below the shoulder and to completely remove the axillary glands. Yet this patient, a physician, had watched a wart in this area for twenty years and then observed the development of an

ulcer for two years and did not seek advice until the contracting finger interfered with function.



Fig. 22. -Ulcer of hand.



Fig 23.—Precancerous lesion.

Another patient showed a fungous tumor involving the dorsum of the middle fingers and the hand. The thumb and little finger were uninvolved. This patient, aged sixty-four, burned the knuckle of his hand opposite the middle finger fifty years ago. He was a fisherman and exposed to the cold in winter. During each winter an ulcer formed in the scar, but healed during the summer. Three years ago the ulcer did not so heal, but a warty growth developed which has gradually involved the area shown in the illustration. The local growth was removed, saving the thumb and little finger. It proved to be a fully developed carcinoma spinocellulare. The axillary glands showed no metastasis. The patient is well now, almost two years since operation, but the hand has not much function.

Fig. 23 illustrates the stage at which a skin lesion should be excised. Removal of the Axillary Glands. When the local disease on the upper extremity is a fully developed carcinoma of the spindle-cell type, the glands should be removed whether they are palpable or not. We have a few patients living five or more years, whose glands showed metastasis after operation, even when the cancer was situated some distance from the axilla and the local and metastatic growths were removed separately.

The cases illustrated need no further comment.

Epithelial Tumors of the Lower Extremity. The development of cancer in the unhealed ulcer of a burn is a far more frequent occurrence than the development of cancer in the ordinary leg ulcer. When cancer does develop in either, the question to be decided is, In what type of malignant local growth should the glands in the groin be removed? When the tumor which has developed in the ulcer still preserves the picture of a wart, and there is no deep infiltration into the base of the ulcer by the cancer mass, my records show that there is no necessity to remove the glands. The record of a patient with a cancer in an ulcer in the scar of an old burn, locally excised by Dr. Halsted in 1903, showed this patient is well in 1918, fifteen years later.

Fig. 24 is the surface appearance of a cancer of the type of a malignant wart, in which, after the local removal, the glands were not excised because of the microscopic appearance of the malignant wart. It is now two and one-half years since operation and the patient is well. The objection to the complete removal of the glands in the groin is the secondary lymphatic edema, and for this reason it is very helpful to the patient for the surgeon to know in what type of local growth the

glands should be removed.

The patient in the case just mentioned was a male, aged fifty-one years. The leg ulcer had been present for thirty years following a contused wound. In the first six years it healed on two occasions. Two years ago it began to grow and was partially excised and grafted. The grafts failed to take. For the past six months it has grown in local extent and the surface of the tumor has become more elevated. It now almost encircled the leg from the level of the ankle to the middle of the calf. It has the surface appearance of a wart. The roentgen-rays showed some periosteal new-bone formation and some bone absorption on the shaft of the tibia. At operation, I demonstrated that the new growth

of epithelial tissue extended to the periosteum of the tibia and fibula, and in some places the periosteum was destroyed and the base of the



Fig. 24.—Carcinoma in leg ulcer.



Fig. 25.—Carcinoma in leg ulcer, July 1, 1916.

malignant, warty growth rested upon the cortical bone. The growth was removed with the cautery, and the shaft of the exposed tibia and fibula were chiselled and burned with the cautery. The wound a few days after operation is shown in Figs. 25. The burned bone separated as a sequestrum, and when the entire wound was covered with granulation tissue and this granulation tissue had been studied microscopically without finding any evidence of cancer the area was grafted in two stages. The first grafting was done one month after the primary operation and the second graft about two weeks later. The result of the graft is shown in Fig. 26.



Fig. 26.—Result, September, 1916.

This case illustrates the value of the cautery in the removal of certain types of malignant disease.

In ulcers of the skin we may have the gross appearance of a malignancy and in the piece excised for diagnosis we may find an atypical growth of epithelium very suggestive of carcinoma spinocellulare, and yet, the lesion may be syphilitic or tubercular. In all ulcers, therefore, these possibilities must be borne in mind, and if the removal of the ulcer suspicious of malignant change means a mutilating operation, syphilis and tuberculosis should be excluded.

Fig. 27 illustrates an ulcer on the ankle which had the surface appearance of carcinoma. The frozen section from the edge had somewhat the appearance of carcinoma, but in this instance the Wassermann was positive, and the ulcer healed and remained healed after salvarsan.

Fig. 28 is the gross and microscopic appearance of a benign wart of the basal-cell type. This is the stage in which local lesions of the skin should be excised. A wart of this kind, left alone, develops into a basal-cell ulcer or fungus, and may grow to great size. But the patient never can tell that the wart is a basal-cell tumor. It may be of another cellular character and associated with the development of malignancy;

metastasis may have taken place. I have before me now two similar pictures of small fungous tumors in this situation which were not excised: one proved to be a carcinoma spinocellulare, and the removal



Fig. 27

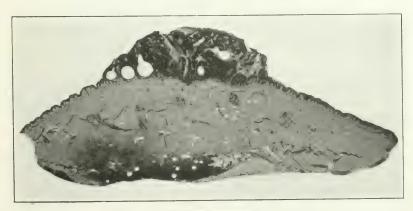




Fig. 28—Benign wart in skin of abdomen 18

of the metastatic glands did not accomplish a cure. The other proved to be a sarcoma in an angioma, and the patient died within two years of metastasis to the lungs. There is very little gross difference between the skin lesions which develop later into malignant tumors of the basalcell and those of the spindle-cell cancer, the sarcoma in an angioma, or the malignant pigmented mole. All at first are small, elevated skin tumors of the type of warts, moles or nevi. The next stage is ulceration and fungous formation. The delay to this stage in the basal-cell tumor does not affect the result of the operation, but in all the other types metastasis may have taken place. In the malignant pigmented mole this is always fatal. When associated with carcinoma spinocellulare, cures have been accomplished after removal of the glands. In sarcoma, now and then we observe a cure after removal of the glands.

The evidence, therefore, shows that, with few exceptions, it is impossible to tell what the final outcome will be of any apparently innocent skin lesion, and when small fungous tumors or ulcers are removed, the microscopic study should be the invariable rule, because on this microscopic study, and upon it only, can the surgeon decide whether the neighboring glands should, or should not, be completely excised.

Sarcoma of the Skin. Space forbids further illustrations, or any extended remarks, but the evidence in my laboratory and in the literature proves that in the majority of patients who come under observation with a sarcoma of the skin give either a history of a congenital tumor of the type of a nevus or of a hard nodule, fibroma or the existence for a number of years of a quiescent tumor of the type of an angioma or fibroma. Every individual, therefore, had ample opportunity to seek the complete removal of this visible and palpable tumor when the chances of a cure were 100 per cent.

Sarcoma of the Soft Parts. The same statement is true, but not to such a large extent, when the tumors are situated subcutaneously. This may be due to the fact that the tumors were there, but not felt. Apparently, however, there is a definite group of sarcoma arising in the subcutaneous or intermuscular fascia, or in the intramuscular stroma that have no relation to a preëxisting neoplasm, but apparently begin their growth in granulation tissue after a trauma. This knowledge should urge the medical profession to carefully instruct their patients who have received bruises to report immediately if the swelling following the injury does not quickly subside, or when a swelling appears after an interval of freedom.

When swelling persists or appears after a contusion, an x-ray should always be taken, because, if it is due to an ossifying myositis, this will be shown. If there is no bone shadow in the swelling, and the Wassermann test and the salvarsan therapeutic dose are negative, the palpable area should be explored at once.

Radium and X-rays in the Treatment of Tumors. Based upon my own experience, the careful reading of the literature and personal discussion with my colleagues, I am convinced that where the experience of surgeons has demonstrated a known per cent. of cures, that radium and the x-rays should not be attempted. For example, in operable tumors of

the breast, in early lesions of the lip, and in local tumors of the skin everywhere, surgery has demonstrated its ability to offer a larger possibility of a cure than any other yet known treatment. I have a number of cases of very early lesions of the skin which could have been completely excised under local anesthesia in a few minutes, but have grown rapidly after radium and the x-rays, and have become inoperable.

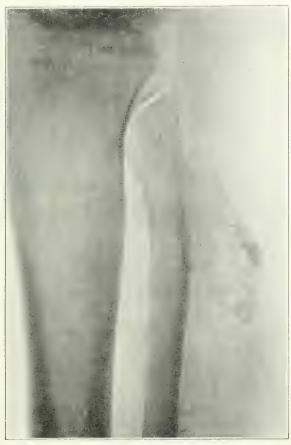


Fig. 29.—Pathological No. 16420. Benign exostosis of shaft of fibula, lateral view. X-ray by Dr. E. A. Smith, of Milwaukee. Tumor observed during convalescence from typhoid. X-ray taken three years after onset. No change in tumor three years later.

The one lesion of which, as far as I know, surgery has never accomplished a cure, is lymphosarcoma of the lymph glands, and apparently radium has done so. Therefore, as soon as this diagnosis is suggested and established, radiations should be given, and continued at intervals, to the entire lymphatic-gland system. I have had a large experience now with lymphosarcomas appearing as a unilateral enlargement of one tonsil in the adult, with some excellent results. But in these cases one must always remember to expose the entire lymphatic system to radia-

tion. One of the cases of lymphosarcoma of the tonsil which reacted rapidly to radiation of the area of the tonsil and glands of the neck, returned in one year with glands in one groin. These glands were removed and radiation applied. The patient is living four years after the removal of the glands of the groin. This patient is now under treatment for involved glands in the neck.

In a second case the enlargement of the glands of the neck practically disappeared after radiation, but the patient returned in a few months with embarrassed respirations and a shadow in the mediastinum, demonstrating that this area should have been treated without waiting for

symptoms.

Radium and x-rays can be employed after operation, or for all inoperable conditions, but the public should know the dangers of trying this treatment first in those cases in which the entire experience of the surgical world gives the apparent indisputable evidence that immediate radical removal with the knife or cautery, or both, promises the largest probability of a permanent cure. At the present time the difficulty is that experts disagree, and the public must choose between two apparently radically opposite views.

Bone Tumors. Exostosis. Eighty-four cases are recorded in the

surgical pathological laboratory of the Johns Hopkins Hospital.

Since the introduction of the x-rays, it has become the most frequent type of tumor of bone. In a number of instances it is a multiple lesion, congenital in origin, and may be associated with a marrow lesion of the type of bone cysts.

In others it is a single lesion, and in this case there is usually a history of trauma. The exostosis is always a periosteal growth. As far as my observations go, it has no tendency to become malignant. In the majority of instances, after a certain period of growth, it remains

quiescent.

The patient's attention is called to the local growth by pain interference with function or the palpation of the swelling. The x-ray picture is characteristic of a benign bone lesion. When the x-rays show a lateral view the bone of the shaft beneath never shows bone absorption. Now and then the cortical layer is thicker. But when the x-ray picture is taken at an angle the shadow of the exostosis overlaps the shadow of the shaft and simulates a marrow lesion, with secondary periosteal growth. The shadow of the exostosis which contains only bone or cartilage, usually bone, cannot always be distinguished from that of a pure myxoma with a bone capsule. This possibility should always be borne in mind, and for this reason, in all doubtful cases, the tumor should be explored, because operation is indicated for the myxoma.

Exostosis Bursata. The periosteal bone tumor is often covered with a bursa, and this bursa may be filled with fluid and give rise to a rapidly growing large tumor. Fig. 42 in Progressive Medicine, December, 1903, illustrates a very small exostosis projecting from the epiphyseal line of the tibia; the larger part of the palpable tumor and the x-ray shadow are due to cartilage and bone growth within the synovial sac

of the bursa.

Exostosis Simulating Sarcoma. I have reported an observation of my own in which the patient, an adult, was referred to the clinic with a diagnosis of sarcoma in the region of the right buttocks. One could palpate here a tumor the size of a child's head. It was of rapid growth of about two months' duration. The clinical appearance was that of a sarcoma. The one x-ray taken at that time did not reveal the exostosis, which was concealed behind the great trochanter; as illustrated in Progressive Medicine, December, 1908, page 196, Fig. 20. At the exploration, however, I found the tumor to be a bursa filled with hemorrhagic fluid. The exostosis was covered with cartilage. The intense pain was due to the pressure on the sciatic nerve. The patient has

remained well ten years since operation.

Benign Bone Tumors. In this group, which includes 30 cases, I exclude exostoses and the benign bone cysts and ostitis fibrosa. The number of cases has greatly increased in recent years, undoubtedly due to early x-ray examination and early intervention. These benign bone tumors are usually periosteal in origin. They are pure myxoma, pure chondroma or a mixture of myxoma and cartilage; rarely are they of pure bone formation. As a rule, in the cartilage and myxomatous tumors of periosteal origin, there is apt to be bone formation in the capsule. The myxoma and the cartilage tumor may appear as a marrow lesion. Then it is very difficult to distinguish in the x-rays from the bone cyst or the giant-cell tumor. I have a strong impression that in our older cases diagnosed periosteal or medullary myxochondrosarcoma, the original lesion was a benign tumor, and there is every evidence that perhaps all of the myxomas and many of the chondromas have a tendency, as they grow larger, to change into sarcoma. Tumors containing myxomatous tissue frequently recur. I was interested to read in older surgeries the statement that pure myxoma and myxochondroma are benign tumors, but they usually recur, and later the patients die of sarcoma. The recurrences, I am convinced, are dependent upon faulty technic in the operation. These tumors are circumscribed and usually have a thin capsule. At operation, they are either enucleated or removed piecemeal, bits of tissue are left behind, and these grow and show a strong tendency to change into sarcoma.

Fig. 19, in Progressive Medicine for December, 1906, p. 223, shows an x-ray of a pure myxoma of apparent periosteal origin, with an incomplete bone capsule. It was situated on the shaft of the humerus. The patient was a white female, aged fifty-three years. There had been tenderness in the area of the tumor for twenty years and a palpable lump nine months. Before its excision it was cut into. Microscopically, it was

a pure myxoma.

In this case there were numerous operations for local recurrences. Seven years after the first operation there was a shoulder-girdle amputation, and three years later death, with general metastasis. Microscopically, the primary tumor was a benign myxoma.

In some instances the recurrent tumor remains benign, and the patients have remained well after a second operation. Fig. 30 shows

⁶⁹ Progressive Medicine, Deember, 1907, p. 220.

an x-ray of such a case. The shadow of the tumor is seen in front of the metacarpal of the index finger and extends to the metacarpal of the thumb. There is no evidence of bone formation or bone destruction in this or the lateral view. The tumor was situated over the extensor surface of the metacarpal bone. The patient was a male adult. There was a history of trauma eighteen years before he came under my observation. Then, after a second trauma, six years later, he noticed a lump, and after this had been present six years, it was removed. It recurred almost immediately, and in the six years since operation it has been growing slowly. I operated in November, 1914, under local anesthesia and used the cautery to separate the more or less



Fig. 30. Myxochondroma.

encapsulated tumor from the soft parts and from the bone. It was attached to the periosteum, but there was no bone infiltration. The tumor was composed chiefly of myxomatous tissue, with islands of eartilage and a spicule of bone. The gross appearance of the tumor is shown in Fig. 31. There has been no recurrence since November, 1914, four years ago.

In Progressive Medicine, especially in relation to giant-cell tumors. I have emphasized the importance of swabbing the marrow cavity with pure carbolic acid followed by alcohol, in order to destroy any tumor cells or tissue which may have been left behind. I am confident that in operations upon apparently benign tumors, one should use some method

—either the electric cautery or pure carbolic acid—to destroy tumor tissue if the tumor is explored or enucleated, or if at any point during

TUMORS



Fig. 31.—Myxochondroma.



Fig. 32.—Exostosis.

the operation the surgeon feels that he is approaching the new growth. My study of recurrences of giant-cell tumors, myxoma and myxochon-

droma of bone, the so-called mixed tumor of the parotid and the intracanalicular myxoma of the breast, demonstrates the importance of this. The patient is not only protected from the lesser danger of a regrowth of the benign tissue, but from the usually fatal possibility of the development of sarcoma in the recurrent growth. In addition to using the cautery and pure carbolic acid, I use an alcohol sponge as an additional safeguard. My records show that in cases in which I have operated myself and used this precaution, there have been no recurrences up to date, while from my study of the literature and of other cases recorded in the surgical pathological laboratory, where this method has not been

employed, there have been numerous recurrences.

Fig. 32 shows an encapsulated bone tumor near the head of the metatarsus of the great toe. It proved to be an osteochondroma arising from one of the sesamoid bones. The patient was a registrant in the selective service of Maryland. The swelling was observed eight years ago following a foot-ball injury. It has grown slowly, and in the past few years he has had to wear a larger shoe, and it has given perhaps a little inconvenience in walking. It was easily removed under local anesthesia. It had a distinct bony capsule. There was no bursa nor a bunion. It pressed upon the shaft of the metatarsus and had destroyed the periosteum, but had excited no bone formation in the latter. The specimen, on removal, was composed chiefly of bone with some cartilage, and the remains of the sesamoid were easily distinguished in one portion of the tumor. It gave the impression that the sesamoid bone had been fractured at the injury, and the tumor developed in one of the fragments, with little or no change in the other fragments.

Benign Bone Cysts. As my experience has increased, I am confident that many of the secondary operations for recurrences in benign bone cysts or ostitis fibrosa are really not recurrences, but a faulty interpretation of the x-ray picture after the first operation. I am also confident that subperiosteal resection, or resection in continuity with bone transplantation, is an absolutely unnecessary operation for a benign bone cyst, and in spite of the brilliant results reported in the literature, it

should be condemned.

The complete healing of a bone cyst often takes a period of one or two years. If one takes x-ray pictures from month to month, as I have had the opportunity to do in a few cases, one is surprised at the slow restoration to a normal x-ray shadow. Now, if during this interval the patient sustains a fracture, diagnosis of a recurrence may be made and reoperation performed.

In some cases the restoration of the area of bone involved in ostitis fibrosa is so perfect that it would be impossible, after a critical study of

the x-rays, to tell that the bone had ever been affected.

The first bone cyst which came under my own observation, in August, 1903, healed perfectly. An x-ray taken two years later showed that healing had been complete (Fig. 33). In this case at the operation nothing was done, except to let out the fluid. The bone cyst belonged to the first type in which there is only a shell of bone and fluid, no connective-tissue lining. This patient is well (1918) fifteen years after

operation, and a recent x-ray shows no changes since the normal findings

in August, 1905.

In 1910, Eisendrath, of Chicago, sent me the histories and x-rays of two cases of benign bone cysts of the shaft of the humerus. One of these was later reoperated on by Sherman, of San Francisco, on a diagnosis of a recurrence from the x-ray.

In 1910, I operated upon a benign bone cyst of the shaft of the humerus. Three months later there was a refracture. From the x-rays, I diagnosed recurrence of the cyst. Ten months later I performed a third operation because of refracture and transplanted a piece of tibia into the bone cavity. This patient is well (1918), with perfect function, and the x-rays show normal bone. I am confident that if I had had the



Fig. 33.—X-ray seven years after operation in case of bone cyst of humerus.

experience then that I have now I should not have subjected this young boy to the two operations, but simply have treated the fracture in the ordinary way.

At about the same time, I operated for Dr. Leary, of Boston, upon a bone cyst of the humerus; he took frequent x-rays, and complete disappearance of the cyst shadow was not observed until about two years after operation. On a number of occasions during this period, Dr. Leary and my friends and colleagues in Boston discussed the question of reoperation for recurrence. This patient is now perfectly well, eight years since operation.

One, therefore, must be familiar with the clinical course and the varying x-ray pictures after an operation for a bone cyst or ostitis fibrosa, and we must not expect too quickly the return of the bone shadow to normal. So long as the shaft of the bone is weakened by the presence

of the cyst or fibrous tissue, refracture is possible, but is not of itself an

indication for operation.

Healing without Operation. In December, 1904, Colvin, of St. Paul, sent me an x-ray of what appeared to be a small bone cyst in the upper end of the ulna, in a girl, aged six years; the swelling had been observed for seven months. In 1915, nine years later, Colvin reported that the patient was well, but the x-rays did not show complete restoration to normal, as in my case (see Figs. 48 and 49).

In 1909, I observed a patient, aged forty years, with a swelling, somewhat spindle-shaped, of the lower end of the ulna. The x-rays showed that the swelling was composed of apparently normal cancellous bone, suggesting the complete healing of an old bone cyst, but not restoration to the normal shape of the bone. The swelling was first observed twenty-five years ago, at the age of fifteen years. It was explored at about that time by Allan J. Smith, of Baltimore, who apparently diagnosed a benign lesion, because he did not amputate or resect. There were two further operations for necrotic bone, probably due to infection of the primary wound. This may explain why the original expansion of the bone cyst did not subside.

In 1914, Fayerweather, of Baltimore, referred to me a patient with a swelling of the lower end of the femur. There was a history of a fracture eight years ago; the patient did not remember much about the existence of much swelling. The x-rays showed an irregular distention, chiefly confined to the outer condyle of the femur, which gave the impression of a healed bone cyst. As it caused very little discomfort, operation was

not advised; the patient is well in 1918, four years later.

Fig. 34 is an x-ray of the lower end of the shaft of the femur in a boy, aged about eight years, whom I saw in Omaha some eight years ago. It is interesting, because the fracture is above the shadow of the apparent bone cyst. In this case there were no symptoms of the cyst. It was found when the x-ray was made after the fracture. At that time I felt it was wiser to delay operation until the fracture was completely healed. Then the x-rays showed that the shadow of the cyst was getting smaller. Further observation and x-ray studies demonstrated complete restoration to normal. For this reason, no operation was performed, and the

boy is well at the present writing.

Indications for Operation. In the beginning of our recognition of this marrow lesion, operations were performed, because in the majority of cases we were unable to make a correct diagnosis. Then we did not know the tendency to spontaneous healing. At the present time, if the shadow suggestive of a bone cyst is found in the x-rays taken after a fracture, or because of the local pain, swelling or loss of function, operation in the majority of instances may be deferred, provided the patient is carefully observed with repeated x-ray examinations. When we have a marrow shadow suggestive of a bone cyst, I do not believe that we can always exclude a giant-cell tumor, a single area of multiple myeloma, a rare focus of tuberculosis, or a still rarer myxoma or chondroma.

The multiple myeloma, so far as we know, is a hopeless disease and is observed in adults; rarely is it a single focus in its onset, and, as a rule,

the urine shows Bence-Jones bodies. The pure myxoma is more common in the small pipe bones, and for this reason nothing is to be gained by postponing the operation when one finds a shadow in a small pipe bone. With the rarest exceptions the bone cyst has its onset before the age of nineteen years, while the giant-cell tumor is usually first obesaved at an older age.

If there is any doubt as to the diagnosis, if the patient is older than nineteen, if the tumor involves a small pipe bone, if further x-rays show an increase in size of the bone marrow tumor, immediate exploration is indicated. The differential diagnosis should be made at the explora-

tory incision. In the majority of instances this is not difficult.



Fig. 34

The findings at the exploration, which are difficult to interpret, are a cavity filled with blood and a solid mass of tissue which is not typical of ostitis fibrosa, or the common giant-cell tumors. Among about 45 cases of benign bone cysts, the fluid contents have been hemorrhagic in only one instance. Among over 40 cases of giant-cell tumor, a cyst with hemorrhagic contents has been present in only 2 instances, while among 10 examples of the more malignant marrow tumor, the so-called bone aneurysm, hemorrhagic contents had been present in all but 3 cases. The problem, therefore, is what to do if we find a cavity filled with blood or blood-stained serum. I will discuss this differential diagnosis under Bone Aneurysms.

As a rule, the gross appearance of the tissue lining the cavity of the

various cystic marrow lesions is quite characteristic.

The bone cyst in the majority of cases may have no lining at all—simply fluid within the bony shell. In other instances it has a lining varying in thickness. This lining is firm and not friable as is the tissue lining a bone aneurysm. It strips easily from the bone shell and we frequently find between the fibrous lining and the bony shell a zone of

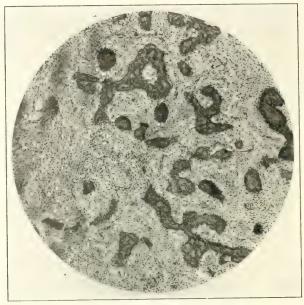


Fig. 35



Fig. 36
Figs. 35 and 36. –Bone tumor, osteitis fibrosa.

ossifying tissue. This is especially marked at the marrow end. Not infrequently on the surface of the fibrous lining of a bone cyst there may be a white, granular substance due to deposits of calcium salts. The finding of ossifying tissue and of calcium salts in my observation is characteristic of the benign bone cyst and ostitis fibrosa.

The gross and microscopic appearance of ostitis fibrosa will be found in Progressive Medicine for December, 1916, p. 326, Figs. 64, 65,

66, 67, 68 and 69.

Nevertheless, some surgeons and pathologists find difficulty in differentiating ostitis fibrosa from the more malignant bone marrow tumors. Figs. 35 and 36 illustrate the gross and microscopic appearance of piece of tissue removed from the marrow cavity of the lower end of the tibia. In this case, fortunately, curetting was the first operation, and there has been no recurrence since 1916.

Now and then, in the benign bone cyst, we see little red currantjelly areas or a mixture of red areas and white fibrous areas which would suggest a giant-cell tumor, and these areas show giant cells. When this is found, I believe that the marrow cavity should be more

thoroughly curetted and then swabbed with pure phenol.

The tumor tissue of the giant-cell tumor is entirely different from that of ostitis fibrosa. In the first place, it is very friable. In the second place, it has a peculiar and almost characteristic color. In the majority of cases it looks like granulation tissue. In some instances there are red currant-jelly areas, in other cases there is a mixture of the granular, mottled dark red giant-cell tumor tissue and the firm, white tissue resembling ostitis fibrosa.

The distinguishing feature of the tissue lining the bony shell in bone

aneurysm will be discussed later.

Tuberculosis is recognized by the characteristic pus and caseation. Cartilage, of course, is easy to recognize. The myxomatous tissue is more difficult to differentiate. The myxomatous tissue, however, can be told at once by a frozen section. In the few cases that I have seen, it had not the coloring of a giant-cell tumor, nor the firmness of ostitis fibrosa. It is often gelatinous. When myxomatous tissue is exposed, I am confident that the remainder of the operation should be done, if possible, with the cautery, and the cavity thoroughly swabbed with pure phenol followed by alcohol. In the majority of instances the gross picture at operation for a benign cyst and ostitis fibrosa is not a difficult one to recognize. Having exposed and recognized it, it does not add any danger to the operation to completely remove the fibrous lining, if present, but larger bone cysts require different handling, because of the danger of hemorrhage.

Huge Bone Cysts. Although these tumors are becoming less frequent, because, as a rule, patients do not delay, nevertheless the experience

of the past should be remembered when they are attacked.

In Progressive Medicine for December, 1904, p. 182, a huge bone cyst of the lower end of the femur is illustrated which had been present many years. The surgeon attempted an almost complete subperiosteal resection. There was much hemorrhage during the operation and oozing after operation, and the amputation which was performed to check the hemorrhage was done too late.

I have a record of a similar case in which, fortunately, the amputation for secondary hemorrhage was performed immediately and saved the patient's life. For this reason, when, in 1916, Prince, of Rochester, N. Y., asked me to help him in an operation on a huge bone cyst of the shaft of the femur, we made no attempt to partially or completely remove the bony shell when the exploration demonstrated a benign bone cyst.

The chief reason for exploration was first to exclude a medullary myxoma or myxochondroma. Having demonstrated that the lesion was a bone

cyst, nothing further was done.

Benign Bone Cyst of the Clavicle. In May, 1917, Harden referred to me a patient, aged seventy-two years, with a bone cyst of the outer end of the clavicle. This was the first I had observed or seen reported in the clavicle, and perhaps the most interesting feature of all, was the observation that at one point the shell of the cyst had perforated, and the fluid had escaped into the subcutaneous tissue above the clavicle, giving rise to a palpable lump outside the clavicle which suggested malignancy. The patient had had an injury, with fracture of this bone, when he was about seventeen years of age, and a somewhat symmetrical enlargement had remained. He had always been conscious of this part of the body on unusual exertion or prolonged exercise, and he had received there a number of slight contusions. The palpable mass above the clavicle had been observed some months, perhaps nine. I immediately recollected a multiple myeloma, which, in the x-rays, appeared as a uniform expansion of the clavicle and in which we failed to make the diagnosis before operation by not examining the urine for Bence-Jones bodies. The urine in the recent case was negative.

Syphilis is the most common lesion of the clavicle, but there was no evidence in the x-ray picture of a periostitis, only the remains of a slight exostosis which probably dated back to the fracture many years ago. The Wassermann was negative. The x-ray suggested a bone cyst which had never healed, and that recently, from causes difficult to ascertain, fluid had accumulated and the tension was giving discomfort. I, however, could not explain the lobular mass outside the clavicle.

At the exploratory incision under novocaine, we cut out this periosseous mass and fat with the cautery. On gross inspection, we saw what appeared to be myxomatous areas and minute cysts in the fat. I feared then that we might be dealing with a rare marrow myxoma. When I exposed the extended shell of bone I found a definite perforation. On removing some of this shell of bone I found a definite connective-tissue lining, typical of ostitis fibrosa. There were three distinct cavities filled with fluid and particles of coagulated material. Into one of these cavities the perforation communicated. The lining of the cyst was removed with the cautery, the bone was curetted, the cavity swabbed with pure phenol followed by alcohol, and the anterior shell of bone was removed subperiosteally; so that we were able to replace the periosteum of the anterior shell against the posterior shell and practically obliterate the cavity. The wound healed per primam. At the present writing, November, 1918, one year and six months since operation, the x-ray shows almost complete healing. There is still a light shadow here and there.

Microscopically, the fat outside the clavicle containing the myxomatous areas and minute cysts showed no giant cells and no typical myxomatous tissue. The cellular picture suggested an inflammatory reaction of the connective tissue surrounding the escaped fluid from the cyst, which had coagulated. The lining of the bone cyst was typical of ostitis fibrosa. There were, however, areas of hemorrhage, old blood pigment

and organized blood clot—very suggestive of trauma, of which there was a history. There were no giant-cell areas, no areas of young or developed

cartilage and no myxomatous areas.

Operative Treatment of Larger Bone Cysts. In 1915, I had the opportunity to explore a moderately large bone cyst of the upper end of the fibula for Lemon, of Milwaukee. The bony shell was very thin, especially on its anterior and lateral surface, but I found at the exploration that subperiosteal removal of the shell was associated with considerable oozing so it was discontinued. The cavity was lined with a rather thick membrane of ostitis fibrosa. The surface of this lining membrane was covered with white granular material. Between the membrane and the epiphysis of the upper end and the marrow tissue of the lower end, there was distinct new bone tissue. The membrane was thoroughly removed without much oozing, the cavity was swabbed with pure phenol and alcohol; then the thin bony shell was crushed with a hammer and chisel, and pressed against the posterior shell. Before operation, the tibia was solid. At the end of the operation it was frail, due to the multiple fracture. The idea of crushing the bone shell to obliterate the larger cavity of a bone cyst and thus hasten healing comes from an article in the literature the reference to which I have mislaid and cannot find. In this case the leg was put up in plaster and complete solidification of the comminuted and crushed tibia took place within three months. This patient has had no inconvenience since, now more than three years since operation.

Since then, I have had the opportunity to practice this technic on a

second case, with equally good result.

Whether this technic would be possible in the huge bone cyst, I have

had no opportunity to test.

Multiple Bone Cysts. Whenever one finds a single bone lesion x-rays should be taken of other bones to find out whether there is multiple involvement. Among 45 examples of clinically single bone cysts, I have found in 2 instances evidence of smaller cysts in another bone. In both instances the larger cyst was in the shaft of the femur. In one of these cases the second cyst was a small affair in the upper third of the shaft of the fibula in the same limb, and in the second case in the internal portion of the upper epiphysis of the tibia. In a few cases, complete x-ray studies have failed to reveal any other bone lesion.

However; in the majority of cases of my own observation and of those in the literature, no x-ray studies had been made of the other bones. Perhaps future observations will show that the benign bone cyst and

ostitis fibrosa is more frequently a multiple lesion.

In 1904,70 I reviewed Heineke's case of multiple bone cysts, the first apparently studied with the x-rays. The full literature on this subject is given in my article in the Annals of Surgery for August, 1910. Since then there have been no new or interesting features reported.

Bone Cysts Appearing as a Multiple Cystic Lesion. In the great majority of cases the cyst is single. I have just noted that the one

⁷⁰ Progressive Medicine, December, 1904, p. 187.

which I observed in the clavicle had three distinct cysts. I have one observation which up to the present time is unique. I have to thank Dr. Hotchkiss, of New York, for the x-rays and specimen. The x-rays show a lesion of the lower end of the tibia, chiefly involving the internal malleolus and the outer half of the epiphysis and shaft. The suggestion of multiple cysts is present in the anteroposterior view, but not in the lateral.



Fig. 37. Case of giant-cell sarcoma of tibia. (Hotchkiss.)

The patient of Hotchkiss was a white male, aged twenty-three years; his attention was called to the lower end of the tibia by a swelling four years before operation. The swelling gradually increased in size. There was pain on walking. The palpable tumor apparently had a bony shell which was firm and gave no parchment crepitation. At operation, a piece of the bony shell was removed, the tumor, composed of fibrous tissue containing multiple cysts, was removed from the shell and the cavity curetted, swabbed with pure phenol followed by alcohol.

I am informed that several months after the operation, in 1910, x-rays of the result were taken and a diagnosis of recurrence made.

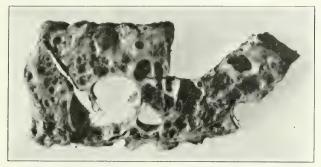


Fig. 38.—Giant-cell sarcoma in osteitis fibrosa.

The patient refused further operation and has been lost track of. Fig. 38 is a photograph through the gross tissue. It differs from the ordinary



Fig. 39

picture of ostitis fibrosa in the presence of numerous cysts. The tumor tissue itself had no capsule. In addition, there were various areas,

reddish in color, but not friable like the giant-cell tumor. The tumor was firm and somewhat rubbery in character. Microscopically (Fig. 39), we find a rather cellular ostitis fibrosa tissue riddled with cysts which, as a rule, are lined by cells of the osteoblastic type, with here and there giant cells. The contents of the cavity was slightly hemorrhagic and contained granular material like calcium salts and degenerated cells. The higher power view of the tissue and lining cells of the cyst is shown in Fig. 40. The red currant-jelly areas scattered in the firm white fibrous tissue of the ostitis, fibrosa are composed chiefly of giant cells. The unusual features in this case are the multiple small cysts and the numerous giant-cell areas. Otherwise, it does not differ from the usual



Fig. 40

benign bone cyst with an almost solid connective-tissue lining. It is quite possible that in this case there was no recurrence, but the x-rays of the healing bone cavity was diagnosed as a recurrence.

Giant-cell Tumors. There is very little to add to what I have previously reported on this subject, except new cases and new locations, and one case in which there was a combination of a giant-cell marrow

tumor and two others on a neighboring tendon sheath.

In all the cases reported in Progressive Medicine, and in the Annals of Surgery for August, 1912, and those that have been observed since there have been no recurrences, except in one case in the upper end of the fibula curetted by Chambers, of Baltimore, in 1910. But in this case my records show that the cavity was not thoroughly disinfected nor

TUMORS · 291

swabbed with pure phenol and alcohol. At the second operation the lower end of the radius was resected. This operation was one year after

the first operation.

There is a very interesting recent article by George Barrie, 71 of New York, who discusses fibrocystic and cystic lesions in bone, with x-ray pictures. Barrie has advocated the name of hemorrhagic chronic osteomyelitis for the giant-cell tumor.72 As to the etiological factors of these marrow lesions, he mentions metabolic, syphilis, tuberculosis, other bacterial infections, parasitic and hemolytic, and also that trauma apparently plays a large part in the localization. As a matter of fact, there is yet no consensus of opinion in regard to the etiological factor of ostitis fibrosa and the giant-cell tumor. We have no evidence that syphilis, tuberculosis or any of the identified bacteria play any part in this bone-marrow process. Ostitis fibrosa answers the question of an inflammatory pathological process. The giant-cell tumor is a borderline lesion between an inflammatory and a neoplastic. If there is any relationship between ostitis fibrosa and the giant-cell tumor the evidence is only suggestive. At the present time I am inclined to believe that it simplifies our investigation to retain our nomenclature and not to complicate the subject by additional names to describe subdivisions of these two fairly distinct pathological processes, until we have demonstrated some etiological factor. At the present time in the majority of cases we have sufficient knowledge as to what is best to do for the cure of the lesion with the least mutilation.

Barrie advocates swabbing the cavity with tincture of iodine and advises against phenol, zinc and other destroying chemicals followed by the use of alcohol. But I cannot find that he presents evidence to allow this conclusion. I have had no experience with iodine. Apparently, Barrie does not understand why surgeons have used phenol, zinc, alcohol, very hot water and the cautery. My object in using these destructive agents is to destroy tumor tissue which may be left behind. Perhaps iodine will be just as efficacious, but Barrie uses iodine, not for its destructive effect, but to stimulate healthy granulation tissue. I have never seen any harm done to the healing process by the destructive agents. Perhaps in the bone cyst their employment is unnecessary, while the evidence strongly indicates the employment of some destructive agent after curetting for the giant-cell tumor, or the enucleation of myxomatous tissue.

Giant-cell Growth of Bone and Tendon-sheath. Leonard W. Ely⁷³ reports a most interesting case. The patient was a white female, aged twenty-seven years. She came under observation with a limp and a swelling occupying the lower end of the right fibula. There was a distinct history of a sprained ankle three years before, after which there was an apparently complete recovery. Then there was a history of a second sprain of the same ankle one year before examination. But now the pain and swelling did not disappear, although it did not increase. During the pregnancy with her only child there is no note of increased discomfort,

72 Ibid., February, 1917.

⁷¹ Annals of Surgery, March, 1918.

but since the birth of the child, now eight weeks of age, the local condition

has become more painful.

Examination. The swelling of the lower end of the fibula is described as being rounded, elastic and tender. There is a second small mass below the malleolus apparently not connected with the main tumor. The x-ray (Fig. 41) reminds me of a bone cyst operated on by me some years ago.



Fig. 41.—Skiagram of growth in fibula. (Ely.)

At the operation by Ely, the tumor was covered by a thin bone shell. Beneath the shell there was exposed reddish-brown tissue. The frozen section portrayed a giant-cell tumor. Below the malleolus there was a second mass the size of a bean apparently encapsulated, adherent to the sheath of the peroneal tendon. This little tumor was removed. The giant-cell tumor tissue in the bone cavity was removed with the curette and some of the shell of bone was removed. In doing this, two masses of the same tissue were found outside the bony shell adherent to the peroneal muscle and tendon. There were, therefore, three distinct tumor masses: one occupying the cavity in the lower end of the fibula, and the other two adherent to tendon sheath.

Ely, in discussing the literature, apparently does not understand why I advocated swabbing the cavity in the bone with phenol. Perhaps I may have inadvertently used the word disinfection. I am quite certain that in a number of my communications I clearly discussed the object. The disinfectant was used not for bacteria, but to destroy tumor tissue

and cells which might be left behind and cause recurrence. From a large experience with giant-cell tumors, myxoma and the so-called mixed tumors of the parotid, I am confident that recurrence does take place from friable tumor tissue or tumor cells left behind when one curets or enucleates the tumor. In my records I have numerous examples of giant-cell tumors in bone, but I have never observed one in the lower end of the fibula. I have numerous examples of the giant-cell tumor in tendon sheaths, but this is the first case in which the giant-cell tissue has arisen both within the bone and from the tendon sheath.

This case may be looked upon as good evidence that giant-cell tumor or growth may be caused by trauma, or arise in the granulation tissue

residual after trauma.

The classification of the THE MORE MALIGNANT BONE TUMORS. tumors which have just been described—the exostosis, osteoma, chondroma, myxoma, the bone cyst and the medullary giant-cell tumor, is not difficult from their pathology and from their x-ray picture. The other form of bone tumors of primary origin are sarcomas not unlike sarcoma outside of bone, except they are modified in their local growth by their origin, either in the marrow cavity or from the periosteum. The growth of the tumor also shows considerable differences when situated on different bones. These sarcomas of bone also differ from sarcoma of the soft parts in that in their growth they may excite periosteal and endosteal bone formation, which is of varying degree, more marked in periosteal growth than in the marrow, and the degree of bone production apparently varies with the different types of sarcoma and the different stages of their growth. Apparently until recent years, when patients came under observation late, we did not observe the same amount, especially of periosteal bone formation, in these malignant tumors, than we have in more recent periods, especially the past two or three years.

In addition, these more malignant sarcomas produce bone destruction. The marrow tumors rarely, if ever, expand the bone with the preservation of the bony shell as is observed in the bone cyst and the giant-cell tumor. But they destroy the cancellous and outer table of the bone, perforate to the periosteum, then excite periosteal bone formation, perforate this, push away or infiltrate the surrounding soft parts and often carry with the tumor tissue bone-forming cells, so that bone formation may be seen in the tumor shadow, some distance from the

bone itself.

When the medullary or marrow sarcoma perforated the bone and gives rise to a new growth on the outer side, with or without periosteal bone formation, it is impossible to tell where the primary origin was. The periosteal sarcoma in the vast majority of cases is associated with bone formation in its onset. This may cease after a period, but in some instances it may continue and be present even in the largest periosteal growth. The periosteal sarcoma, like the marrow, rapidly infiltrates bone with destruction and the tumor cells grow along the Haversian canals and give rise to tumor areas in the cancellous bone and marrow. These tumor cells apparently excite new bone formation, so that we find areas of tumor without bone, and areas of increased bone formation in

the center of the invaded bone. When the periosteal tumor has produced a large tumor area in the marrow, it is very difficult to tell whether it

was a periosteal or medullary sarcoma.

At the present time my figures show that we have recorded about 50 cases of periosteal sarcoma and about 28 which apparently are medullary in origin. But when we examine early cases, we find the proportion of marrow tumors is distinctly less. The most frequent definite marrow sarcoma is generally cystic, containing blood, and is usually described in the literature under the term of bone aneurysm.

When we study sarcoma-of the skin or soft parts, we, as a rule, can recognize two distinct types: One arises in a definite preëxisting tumor, probably originally benign, and when we study these tumors microscopically, we can recognize areas of the old benign tumor—fibroma, angioma, myxoma. In sarcoma of the skin, there is a definite group with the distinct history of a preëxisting angioma or fibroma. In sarcoma of the soft parts, a definite group exists in which there is a long history of a palpable, more or less quiescent tumor.

In the other form of sarcoma there is no history of a preëxisting lump of long duration, and we rarely find in the tumor any evidence of the benign type of the connective-tissue tumor, but a cellular tumor of the

most malignant form of sarcoma.

In bone, the less malignant forms of sarcoma that might be called fibro-, myxo- or chondrosarcoma are less frequent, and, when we find this histological picture in a bone tumor, we usually get a history of long duration. The most common type of bone tumor of this variety is the myxochondrosarcoma. We know that in bone formation there is a cartilage period, and islands of cartilage may remain. These islands have been found at autopsy, and chondroma, myxochondroma and pure myxoma are rare but well-recognized clinical forms of new growth in bone, both periosteal and endosteal.

At the present time, the majority of recorded cases of the more malignant periosteal and medullary sarcoma of bone ultimately die of metastasis to the lung in spite of high amputation. I have recorded a few

permanent cures.

When the public and the profession are properly informed and act quickly, surgeons and roentgenologists may have a larger opportunity to observe these more malignant sarcomas a few weeks after the onset of symptoms, such as pain, swelling, limp, or any slight interference with function. At the present time, we have too few observations to allow us to describe the x-ray findings or the pathological picture of the earliest

stages of periosteal and medullary sarcoma.

The most important clinical fact to remember is apparent definite relation of trauma to the more malignant sarcoma of bone. The trauma rarely produces a fracture, and for this reason x-rays have not been taken until there are definite clinical symptoms or signs. It is quite true that in the majority of cases of trauma to bone, sarcoma does not develop, but until we bear in mind this possibility and take early and repeated x-rays, we will fail to recognize the malignant disease in the stage most favorable for a perfect cure.

One cannot but get the impression that the more malignant sarcomas of bone and soft parts have a definite relation to trauma, and that the neoplasm is a secondary growth in granulation tissue and not a secondary growth in a preëxisting tumor, the cells of which are of embryonic origin. The relation of trauma to this type of sarcoma is very similar to the relation of chronic irritation and unhealed ulcers and sinuses of the skin and mucous membrane to carcinoma. We can never tell why, or when, the malignant change takes place, but the possibility must always be borne in mind.

When there is chronic irritation of the mucous membrane or an unhealed ulcer or sinus, there is always ample opportunity to protect the individual by the cure or removal of the local area. But after contusion of soft parts or bone, we cannot observe the concealed area of granulation tissue, and at the present time we have no evidence to allow us to conclude what measures should be resorted to which will ensure the normal healing of the wound. Theoretically, a period of rest would seem to be

the only treatment.

Periosteal Lesions of Benign Character which Must Be Dif-FERENTIATED FROM PERIOSTEAL SARCOMA. Ossifying Myositis. There is always a history of a contusion and, after an interval of weeks, the palpation of a tumor is possible, and the x-ray shows a mass or area of ossification, frequently with cyst formation. When the periosteum is not involved, and the x-ray shows a normal shaft with a clear intermediate zone between it and the shadow of the ossifying tissue, there is no difficulty in making the diagnosis. But when, in addition to ossifying myositis, there is an ossifying periostitis, the differential diagnosis is more difficult. The gross and microscopic study at exploration should differentiate from malignant disease in every instance. There is no question that, in the past, ossifying myositis has been incorrectly diagnosed as ossifying sarcoma, but, as a rule, only by surgeons, roentgenologists and pathologists not familiar with the x-ray and pathological picture of the benign or malignant lesion. Fig. 61 is one in which a diagnosis from periosteal sarcoma might at first sight be difficult. The differentiating point is, in spite of the bone formation, most marked on the shaft of the fibula and less distinct in the muscles of the calf; there is no evidence of bone destruction beneath the periosteal growth in the shaft.

Other x-ray pictures will be found in Progressive Medicine for

December, 1913, p. 259, Figs. 40 to 44.

When in doubt, exploratory operation is indicated, but, if ossifying myositis is revealed, experience has shown that it is better not to incompletely excise if the ossifying tumor is small and can be completely

removed. Incomplete operations excite further growth.

Figs. 42 and 43 picture the patient, the specimen removed at shoulderjoint amputation, and the x-ray of the specimen of a very remarkable tumor which at the time of the operation, in 1894, was diagnosed "osteosarcoma." The patient was a white male, aged thirty years; the swelling appeared after trauma and was of eighteen months' duration. It has gradually increased. The palpable mass was firm, and at that time Halsted was of the opinion that it was a periosteal sarcoma with bone formation. At his suggestion I amputated the arm through the shoulderjoint without exploratory incision. The patient lived eight years and



Fig. 42

died of other causes. The microscopic section showed, between the bone tissue, tissue resembling bone marrow and chronic inflammatory tissue.



Fig. 43

There are no cellular areas even suggestive of sarcoma. We now know that this is an example of a very extensive ossifying myositis extending

to the shaft associated with ossifying periostitis—an entirely different pathological and x-ray picture from periosteal sarcoma. You will observe in the x-ray of the specimen no bone destruction of the shaft. Had this patient come under observation at a later date, undoubtedly we would have recognized the benign process, and the patient would not have been subjected to operation. I have seen specimens of this kind in a number of museums diagnosed osteosarcoma, and it represents one of the forms of the so-called osteosarcoma that surgeons cure by amputation.



Fig. 44.—Ossifying periositis, traumatic, recurrent. Aged twenty-five years; traumatour and one-half months. x, new bone formation.

Traumatic Ossifying Periostitis. Contusion of bone frequently is followed by local tenderness, which may persist weeks or months. Sometimes it is associated with palpable swelling, in many cases there is no definite swelling. Immediate x-ray studies may show a negative picture, but if x-rays are taken at the bone-forming period—two to four weeks after the trauma shadows of periosteal bone formation may be seen. In periosteal sarcoma there is usually a history of trauma. It is quite true that in the sarcoma there is apt to be a history of an interval free from pain or swelling after the subsidence of the primary symptoms and then a recurrence of pain and swelling, while in traumatic periostitis the symptoms persist from the onset and gradually decrease. But none of us are given an opportunity to observe clinically, and, with the x-ray, cases of this kind from the time of the initial lesion. I have had the opportunity to observe and report some 25 cases, but in none of them has sarcoma developed. The interesting point which I have demonstrated from this experience is that pain and tenderness may persist

even without the demonstration of bone formation for nine months to

one year.

Fig. 44 is an x-ray of a case of traumatic periostitis, which was diagnosed from the x-ray as periosteal sarcoma, explored by a surgeon and the diagnosis of sarcoma made from the section of a piece of the osseous tissue removed at the exploratory incision. In this case shoulder-girdle amputation was advised, but, fortunately, refused by the patient. I saw this x-ray in 1910. The patient was a white male, aged twenty-five years. Four and one-half months before he had received a kick in this area during a football game. It was followed by the swelling and discoloration of a severe bruise. About one month later, because the pain and tenderness persisted, and because there was a palpable lump on the shaft of the humerus, the x-ray was taken, and an exploratory operation performed. The roentgenologist failed to observe in this case that there was no destruction of the shaft of the humerus below the bone tumor in the periosteum. He also failed to observe the periosteal ossifying area in the outer end of the shaft of the clavicle. Periosteal sarcoma, in my experience or in the literature, is never multiple in origin. The shadow of the periosteal growth in this case on the shaft of the humerus might, of itself, be difficult to distinguish from the shadow of an ossifying periosteal sarcoma. But, so far, in all the cases of sarcoma which I have observed, definite bone destruction can be seen in the x-rays beneath the periosteal growth.

The pathologist, in examining the piece removed, misinterpreted the slightly spindle-cell granulation tissue between the bone islands as spindle-cell sarcoma. In this case I felt justified in exploring again and removing another piece for diagnosis. A diagnosis of ossifying periostitis was made and nothing further was done. This patient is well in 1918, eight years after operation, but I have no opportunity to take

other x-ray pictures.

Syphilitic Periostitis. In this benign lesion there may or may not be a definite history of trauma. Pain and swelling lead to an x-ray study. This may be interpreted in the x-rays or at the exploratory incision from

the microscopic picture.

In syphilitic periostitis, in addition to the new bone formation, there may be a suggestion of bone destruction in the shaft beneath the periosteal growth. It is a more difficult lesion to distinguish from early periosteal sarcoma. When explored, the lymphoid cells of the syphilitic granulation tissue may suggest a small, round-cell sarcoma. As the history of syphilis does not exclude the possibility of sarcoma, this is not helpful. But if one makes it the absolute rule in all bone lesions to test the blood and to give salvarsan, even if the Wassermann is negative, syphilitic lesions of bone will be recognized by the rapid restoration to normal in the x-ray picture after salvarsan. It is usually observed within ten days or two weeks. In many cases of ossifying syphilitic periostitis there will be found involvement of more than one bone. This practically excludes sarcoma. Also the involvement of the single bone is more extensive in a longitudinal direction along the shaft than in sarcoma.

In the cases of syphilitic periostitis referred to me with the diagnosis of sarcoma, in every instance no Wassermann had been taken and no salvarsan given. Fig. 45 is a photograph of a forearm of a white male, aged seventeen years. There was a definite history of trauma. Two months after the trauma, on account of a spindle-shaped swelling about the lower end of the ulna, an exploratory operation was performed without either an x-ray or a Wassermann. The microscopic section of the piece removed was diagnosed round-cell sarcoma. As the swelling did not subside after three weeks' trial of Coley's serum, amputation was advised. The patient came under my observation eight months after the trauma, and six months after the exploratory operation. The photograph shows that the wound had not healed. There were sinuses and a spindle swelling. Supination was restricted. The x-ray showed involvement of the ulna only. There was periosteal bone formation and irregular bone destruction which might have been due to the operation. The sections of the piece removed at the exploratory operation resembled the lymphoid granulation tissue of syphilis more than sarcoma. The blood reaction to the Wassermann test was positive and the syphilitic



Fig. 45.—Syphilitic lesion of forearm.

infection was apparently congenital, because the father and two brothers gave the same reaction. Salvarsan produced within one week a definite change for the better in the swelling, and improvement in supination. In this case I excised the scar, including the sinuses, some of the periosteal bony growth, because from the x-ray I expected to find a sequestrum, which, however, was not revealed at operation. The wound healed and this patient is well in 1918, seven years after operation.

It is remarkable how frequently surgeons will proceed to operate upon bone lesions without first taking a blood test or administering a therapeutic test of salvarsan. Only one year ago a physician of large experience brought his wife to my clinic with an x-ray showing an ossifying periosteal lesion of the clavicle and a section of a piece of tissue excised and the diagnosis of sarcoma had been made both from the x-rays and the microscopic section. A Wassermann had not been taken nor salvarsan given. A careful clinical history suggested a specific infection at a former marriage. The Wassermann was positive; the local signs and symptoms disappeared after the administration of salvarsan.

Periosteal Sarcoma. Periosteal Giant-cell Sarcoma. Except on the alveolar border of the jaws, where it is common and appears as an

epulis, periosteal sarcoma composed of tissue resembling the giant-cell tumor of the marrow is rare. I have come across no cases in the literature, and we have only 4 cases recorded in the laboratory. The first was operated on by Halsted in 1893. It was a distinctly pulsating tumor surrounding the lower end of the ulna. The patient was a colored female, aged forty-five years. After injury, one year before operation, she observed pain; a few months later swelling around the lower end of the ulna. The tumor at the time of the operation involved the lower third of the ulna beginning at the wrist-joint. The skin over it was normal; it distinctly pulsated. At operation, from the appearance of the tissue, Dr. Halsted was of the opinion that it was a giant-cell sarcoma and not the malignant type of periosteal sarcoma. For this reason he excised the tumor with the bone. This patient was followed for nine years, and there was no evidence of recurrence. The periosteal tumor composed of the typical giant-cell tissue was circumscribed, but In places it distinctly infiltrated the surrounding not encapsulated. muscle. The shaft of the ulna surrounded by the tumor had no periosteum, and the bone of the outer table was distinctly eroded and at one point there seemed to be a perforation into the marrow cavity. Microscopic sections demonstrated that giant cells infiltrated muscle, the outer table of the bone and in one spot into the marrow cavity. Undoubtedly, in the x-ray this case would have shown destruction of bone in the cortical zone, but practically no bone formation in the tumor. It is quite possible that this tumor could have been cured with the preservation of some of the shaft. This would have given a better functional result.

It is very interesting to note that this was the first giant-cell tumor observed in Halstead's clinic of the Johns Hopkins Hospital, and that Halsted was able to make a correct diagnosis from the gross appearance simply from his knowledge of the appearance of the more malignant sarcoma, and from his memory of the gross picture of the giant-cell epulis of the jaw and from the scanty literature of that time. I am confident it was my repeated study of this case that allowed me to recognize the giant-cell tumor which came under my observation at later dates, and especially to save the limb of a patient with a giant-cell tumor which I explored in December, 1902. This patient is free from recurrence in 1918. The tumor was curetted from the upper end of the tibia.⁷⁴

The second case observed in Halsted's clinic was a white male, aged thirty-five years. Following trauma, the patient observed pain over the tubercle of the tibia fourteen months before operation. The first small lump in the region of the tubercle had been observed twelve months before operation. This lump was incompletely excised four months before operation and immediately recurred. The recurrent tumor in the sear was the size of a hickory nut, attached to the tibia, encapsulated. Halsted completely excised it with a piece of the outer table of the bone. In the gross it was a typical giant-cell tumor. The patient was followed for seven years, and there were no signs of recurrence.

⁷⁴ See Progressive Medicine, December, 1903, p. 201, Plate V, Figs. 1 and 2.

In differentiating tumors in the position of the tubercle at the head of the tibia one must also bear in mind the swelling here that may follow a partial fracture of the beak-shaped process (Schlatter-Osgood disease⁷⁵).

In a third case recorded in the laboratory, the tumor resembled, clinically and pathologically, the second case just recorded. The situation was the same in a male, aged forty-four years; pain was present for two years, tumor for one year; operation eight months previously; recurrence. The surgeon who operated did not explore, but, on the diagnosis of a malignant periosteal sarcoma, amputated above the knee. This patient was followed for three years. There was no recurrence.

The fourth case was operated on in 1914, by Baer. The tumor was situated on the periosteum of the ilium near the sacrum, in a white female, aged eleven years; onset with pain for five months, which was referred to the hip; swelling occurred in the region of the ilium near the sacrum. At the first exploration a very vascular tumor was exposed, a piece removed and the wound packed. At the second operation, after the diagnosis of a giant-cell tumor had been made, the entire tumor was curetted. At the second operation some spicules of bone were found within the capsule and the tumor. The ultimate result in this case is not recorded.

The possibility of a giant-cell periosteal tumor must always be borne in mind. If pulsation is present, it would be very suggestive of this benign lesion. The x-rays will probably show some bone destruction, but little or no bone formation.

Ossifying Periosteal Sarcoma. The amount of bone formation in the periosteal sarcoma may vary. Recent experience seems to show that even abundant bone formation in the periosteal sarcoma is not always a

sign of a low grade of malignancy.

In an x-ray of a lateral view of a case of ossifving periosteal sarcoma of the lower end of the shaft of the femur which I saw in consultation with Finney, the remarkable features were the rather extensive new bone formation surrounding the shaft of the femur, with little, if any, gross evidence of bone destruction. It was the first case which later proved to be a malignant periosteal sarcoma, in which I failed to find in the x-ray gross evidence of bone destruction of the shaft beneath the periosteal growth. This may have been the fault of the x-rays (but we have a number of pictures taken by good roentgenologists) or it may have been due to the fact that the picture of the shaft was obscured by the overlying shadow of the encircling periosteal bone formation. However, when we compared the architecture of the shadow of the periosteal bone with traumatic and syphilitic ossifying periostitis, with ossifying myositis and with exostoses, we noted distinct differences, and we found a picture apparently characteristic of the more malignant periosteal sarcoma. The shadow suggested rays of bone perpendicular to the shaft running out into the tumor tissue—a picture that may be described as fluffy.

⁷⁵ Progressive Medicine, December, 1903, p. 145, Figs. 14 and 15.

There was considerable difference of opinion as to the diagnosis and as to the method of treatment in this case. First, the patient was given radium. Then Finney removed a piece of the tumor through an exploratory incision; then she received serum by Coley. As there was no

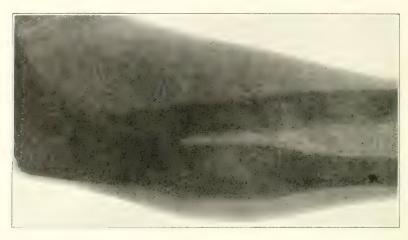


Fig. 46.—Syphilitic periostitis. Aged thirty-five years; symptoms, seven months. Wassermann positive, "606."

improvement, the limb was amputated by Coley in July, 1917, eight months after the x-ray was taken. The patient was apparently well in August, 1918, one year later.

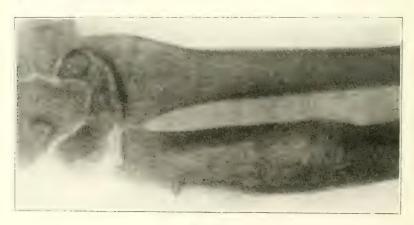


Fig. 47

Unfortunately, in this case I have not as yet had an opportunity to examine the microscopic sections.

I have numerous other personal observations of recent date, and these, combined with the rather scanty recent literature, pretty emphatically demonstrate that, at least for the present, either we have not sufficient

experience or have not studied our material to a degree which will allow any one of us to describe the lesion in such a way as to make the differential diagnosis between benign and malignant ossifying periosteal

lesions simple.

Medullary or Marrow Bone Lesions. I have described in this and previous numbers of Progressive Medicine the more common and more readily diagnosed marrow lesions—the bone cyst and the giant-cell tumor. Due to lack of material, especially of early cases in which the differential diagnosis is difficult, I have put off this very important chapter of bone lesions until there had accumulated a sufficient number of cases of my own or from the literature to allow a clear presentation which would be helpful. At the present time I have the good fortune to have accumulated enough, at least for an introduction.

Syphilitic Osteomyelitis. Syphilis, as a rule, is a periosteal lesion with periosteal bone formation, and, as a rule, no involvement of the marrow, but now and then it may show a diffuse lesion and present a marrow

shadow that must be differentiated from medullary sarcoma.

Such a condition occurred in a patient, aged thirty-five years; the symptoms were pain and swelling of both clavicles and of the shaft of one ulna of seven months' duration. The multiplicity of the bone lesions practically excluded sarcoma. The Wassermann was positive, and I had the opportunity to observe the rapid restitution to normal after salvarsan.

In November, 1915, when I was giving a clinic in the University of Vermont, a patient was brought in with the diagnosis of sarcoma for amputation. The Wassermann was negative; the x-rays showed a lesion of the tibia not unlike medullary sarcoma associated with periosteal involvement with bone formation. It was entirely different from the usual x-rays because of the definite irregular marrow shadow. In this case I advised the intravenous injection of salvarsan before subjecting the patient to any operation. The patient recovered and the bone lesion disappeared. This is the best example I have illustrating the importance of the therapeutic test when the Wassermann is negative.

Pyogenic Osteomyelitis. In the past these patients had either been observed so late in the disease that the diagnosis has not been difficult, or so early that the acute local symptoms practically excluded sarcoma, but pyogenic osteomyelitis may be a chronic or subacute infection of the type first described years ago by Brodie as a chronic abscess of the head of the tibia. In these cases the acute symptoms are absent, there are no sinuses, very little periosteal new-bone formation, no involucrum, but a swelling of a bone and an x-ray shadow picturing marrow destruction in an irregular way, that at first sight might be interpreted as a

medullary sarcoma in an early stage.

The differential diagnosis is made at the exploration by the demon-

stration of pus.

Tuberculous Osteomyelitis of the Shaft. In Progressive Medicine, December, 1900, p. 208, Fig. 60, is shown an x-ray of a tuberculous marrow abscess in a tibia of a girl, aged eleven years, reported by Krause. I have never seen tuberculosis in the x-rays showing a marrow

shadow similar to the one reported by Krause, except in the metacarpal bones.

Three years ago a patient of one of my colleagues had a swelling in the middle of the shaft of the radius which was diagnosed as medulary sarcoma. The patient was treated for some months with radium. The swelling, at first confined to the bone, extended to the soft parts and the x-ray showed that at one point the bony shell had ruptured. Whereupon the surgeon explored and found a huge extraosseous tuberculous abscess between the muscles of the forearm communicating with a tuberculous caseous focus in the shaft. Had this patient been explored she would have been saved the secondary infection of the soft parts and been relieved with an arm with perfect, instead of impaired, function.

Medullary Sarcoma. My records show that x-rays of medullary sarcoma with periosteal involvement or periosteal sarcoma with extensive marrow involvement have been diagnosed by experienced roentgenologists and surgeons as syphilitic or chronic pyogenic osteomyelitis,

and the reverse is also true.

Danforth, of Providence, R. I., sent me an x-ray of a lesion of the shaft of the femur in which the diagnosis impressed me as being one of chronic osteomyelitis than of medullary sarcoma. Yet the sections showed, between the extensive new-bone formation, round-cell sarcoma of the most malignant type, and the patient died in a few months of metas-

tasis to the lungs.

Fig. 48 is the x-ray of a lesion of the upper end of the femur that I felt suggested very strongly an early marrow sarcoma with periosteal involvement. The patient, a white male, aged forty-two years, came to my clinic at St. Agnes's Hospital in May, 1914, with a uniform spindle swelling encircling the upper third of the femur which he had observed about four months. On the inner thigh below there was a scar due to a carbuncle which had been observed five months ago. The palpation of the swelling was more like periosteal or marrow sarcoma than any other bone lesion with which I was familiar. The Wassermann was negative. While the patient was under my observation the resident surgeon inadvertently told him that I was considering amputation. He left the hospital immediately and later entered Jefferson Hospital in Philadelphia. There, at the exploration, a piece was excised for diagnosis, sections of which were sent to me by the courtesy of Da Costa and Coplin (Fig. 49). The section suggests spindle-cell sarcoma. I am not prepared to say what I would have done if this patient had consented to operation, nor can I learn from my colleagues in Philadelphia what they would have done if the patient had not flatly refused further treatment. One year later the patient allowed me to take an x-ray, and the picture showed practically normal conditions. At the present time (1918), more than four years, the patient is well. No salvarsan was given.

In this case, if we had given salvarsan, we might have concluded that we were dealing with a syphilitic lesion. If we had used radium or serum, one could easily have been persuaded to report the case as an example of a permanent cure of a sarcoma diagnosed by x-rays and microscopic sections. It must be an example of a chronic osteomyelitis, with peri-



Fig. 48

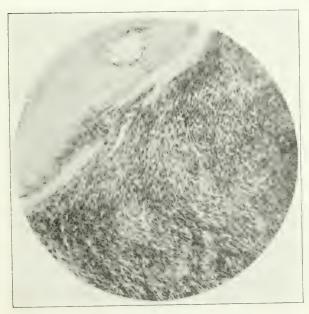


Fig. 49.—Bone tumor. 20

osteal and marrow involvement, in which the portal of entrance of the organism was the carbuncle, and the lesion healed spontaneously.

Malignant Bone Cysts There is a marrow tumor characterized by distention of the bone, as a rule, with preservation of the bony shell, similar to that seen in the benign bone cyst and the marrow giant-cell tumor. The cavity of the bony shell is filled with fluid, usually hemorrhagic. Lining the bony shell there is preserved a zone of tumor tissue varying in thickness. In a few cases so narrow that the presence of a neoplasm can only be recognized in the microscopic section. Microscopically, this tumor tissue is of the type of the most malignant spindle-and round-cell sarcoma; sometimes there is perithelial arrangement. When followed, the majority of these patients died of metastasis. In the older literature these tumors are called bone ancurysms. They might be called medullary hemorrhagic cystic sarcoma. The development of a blood cyst in sarcoma is also observed when the primary lesion is situated in the soft parts.

When the tumor is situated in the soft parts, the benign blood cyst may be an organized hematoma, a huge angioma with a single cavity connected with a large vein, and in some instances we find a blood cyst in ossifying myositis. These tumors do not pulsate—The differential diagnosis between the benign and malignant blood cyst can, in some instances, only be made by the microscopic examination of the wall of the cyst—When tumor tissue can be seen, its gross appearance is usually diagnostic—The giant-cell sarcoma, rare in the soft parts, usually contains a blood cavity—The lining tissue is quite characteristic of the giant-

cell tumor

When this blood cyst appears in the marrow cavity of a bone, how can we diagnose the benign from the malignant? In my own experience, I have never seen blood in a benign bone cyst, although the fluid contents may be slightly hemorrhagic. There are a few cases reported in the literature, also one or two bone cysts apparently associated with hemophilia. In giant-cell tumor arising in the bone marrow the presence of a definite large blood cavity is unusual. I called attention to this first in 1902⁷⁶ a case reported by Jenckel. A marrow tumor in the lower end of the ulna operated on many years ago by G. G. Davis, of Philadelphia, contained blood, and the marrow lining of tumor tissue histologically was a giant-cell tumor. This patient has remained well up to date since curetting—some fifteen or sixteen years.

Nevertheless, when a marrow-bone tumor is explored, and on opening the bony shell a cavity is discovered filled with blood, one should at once think of the possibility of a malignant tumor, and this should be excluded before any conservative operation is done. The great dilemma in the differential diagnosis is to distinguish in the frozen section between the giant-cell tumor which can be cured by curetting and the more malignant round- and spindle-cell sarcoma containing giant cells, which, so far as our experience goes, should be treated by the radical removal of the bony shell with its periosteum, either by resection or by amputation,

Prograssivi, Medicine, December, 1902, p. 153.

The following case, under my observation in 1916, illustrates the difficulties in diagnosis: This patient was a surgeon, aged fifty-six years, who, on July 8, 1916, received a wrench to the left knee. This was followed immediately by pain and some loss of function. Previous to this injury he had never had any sensation of discomfort in this area, nor any limp or fatigue. Nine days after the injury an x-ray was taken and carefully studied by Colvin, of St. Paul, and Geist, of Minneapolis. At this time the pain had become localized to the outer condyle of the femur and was so severe that for a few days he was confined to bed. Nothing abnormal was seen in this x-ray. Numerous x-rays were taken at intervals, because the pain and loss of function continued. On the twelfth day, numerous pictures were again obtained, because there was some fluid in the joint. The x-rays taken one month after the injury show, for the first time, a shadow in the outer condyle of the femur suggesting bone destruction, but no bone formation. I saw the patient on September 1, a few days less than two months after the injury. The x-ray showed a distinct shadow of bone destruction in the outer condyle of the femur, with destruction of the outer table of the bone over the condyle extending to the shaft. The destruction did not extend to the joint.

On examination there was no fluid in the joint. There was tenderness over the external condyle of the femur, and apparently a slight expansion which felt slightly semifluctuating and soft. Walking was painful; there was no apparent infiltration of the soft parts; active and passive joint function was not impaired; the blood Wassermann test was negative. There was no anemia and the differential count and the leukocytes were normal. The urine gave no reaction for Bence-Jones

In the first place this was the first case of which I have a record, and, so far as I know, the first to be reported in the literature in which a series of x-rays after an injury to bone were first negative for any disease, and then showed the beginning of a bone lesion. It differed from all pictures of bone cysts and giant-cell tumors in that over the small tumor shadow the bony shell formed by the expanding and attenuated cortical bone was absent. This had evidently been destroyed. The line of demarcation between the tumor shadow and the shadow of the cancellous bone in the condyle and the shaft was irregular, while in the bone cyst and giant-cell tumor this line is usually more regular and abrupt. That is, I had never observed, nor seen described, a bone cyst, a giant-cell tumor, a myxoma or a chondroma of such small size, or even of larger size, associated with such rapid destruction of the outer layer of condensed bone. Even in the giant-cell tumor there has always been in my observation a huge expansion of the bony shell before it disappeared. I have never had an opportunity to observe, nor have I ever read of such an early case of marrow sarcoma. There was nothing in the picture to suggest a focus of tuberculosis or osteomyelitis. We discussed the possibilities with the patient, and I told him frankly that I was inclined to believe that I would expose a bone lesion which I had never seen before, and the probabilities were that I would have difficulty in the frozen section, or from the gross appearance, in distinguishing between the benign giant-cell tumor which could be cured by curetting and a more malignant sarcoma filled with giant cells which one would expect in such an early case characterized chiefly by bone destruction. In this case resection could easily remove the disease, but at his age, it was my opinion, the functional result of an amputation and an artificial limb were far too good to justify the risk of resection and bone transplantation: the risk to joint function with resection of the condyle. With both of these operations I have had experience, and although the disease had been cured, the functional results were not as good as after amputation.

The patient left the decision as to the character and extent of the

operation to me.

On September 9, 1916, at St. Agnes's Hospital, the external condyle was explored after a rubber bandage had been placed on the thigh. The soft parts were normal. On exposing the outer surface of the periosteum, there were seen numerous branching and ramifying veins a condition of vascularity increased far beyond normal. On palpation, I could feel no bony shell. The expanding periosteum gave a sense of fluctuation. There was no pulsation. I felt, then, that I was dealing with a malignant tumor. The periosteal capsule was incised with the cautery; blood exuded under slight tension. The finger then felt a cavity lined by soft, granular material which, when exposed to the eye, had the appearance of the giant-cell tumor, but was much more friable. The frozen section showed numerous giant cells, but the tissue in which the giant cells lay impressed me more as a malignant cellular sarcoma than the stroma of the giant-cell tumor. For this reason I amputated through the middle third of the thigh. The patient left the hospital in seventeen days, was back at work in a few months, and today, December, 1918, two years and three months after operation, he is well and apparently not at all impaired in his surgical work by his artificial limb.

Fig. 50 illustrates the gross pathology. The chief distinguishing feature from a giant-cell tumor is the destruction of the bony shell and the rather worm-caten, ragged, hemorrhagic appearance of the cancellous bone of the shaft forming the inner and lateral wall. The tumor tissue studied more carefully in the laboratory was distinctly more finely granular than the giant-cell tumor: the latter breaks up into particles of 3 to 5 mm., like cottage cheese, while the more malignant sarcoma breaks up into smaller granules or particles. The microscopic picture at first sight looks like a giant-cell tumor, but when studied with the high power (Fig. 51) disregarding the giant cells, it has the appearance of a mixed round- and spindle-cell sarcoma, without peri-

thelial arrangement.

I am inclined to think that this observation will largely represent our future experience in bone lesions when the public and profession act upon the information that x-rays should be taken after injury and continued until all local symptoms have disappeared, or until some lesion is revealed, and when immediately after the first mention of pain, or interference with function, x-rays are taken.

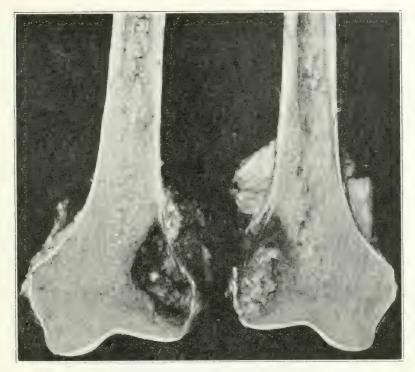


Fig. 50.—Malignant bone aneurysm.

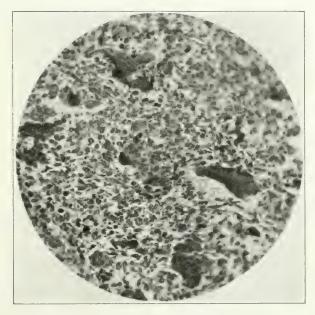


Fig. 51.—Bone aneurysm.

We shall then see bone lesions in their earlier stages, and the probabilities are, we shall require considerable experience before we can establish sharp lines of differential diagnosis in the x-ray and gross pathology, and in the frozen-section picture. I also believe that, in order to improve our diagnostic abilities, we must carefully study the local growths of the different lesions when situated in different bones and in different parts of the same bone. At the present time we have not sufficient material, except perhaps in the lower end of the radius.

for such an investigation.

Osteomyelitis should always be recognized either by the presence of pus or organisms in the cover-slips. Now and then, especially in the region of the joints, tuberculous granulation tissue, without the formation of pus or coagulation necrosis, resembles a cellular sarcoma. The demonstration of a tubercle in the frozen section will differentiate the lesion. I have recently had an example of extensive tuberculosis of the elbow involving the soft parts associated with bone destruction of the end of the humerus only which resembled clinically, in the x-ray, and at the exploratory incision, periosteal sarcoma. In syphilis, the frozen section will always show a lymphoid-cell granulation tissue not unlike small, round-cell sarcoma. The picture of ostitis fibrosa must be distinguished from the fibro-spindle-cell sarcoma. The most difficult frozen-section diagnosis will be that between the benign giant-cell tumor and the malignant cellular sarcoma containing giant cells.

The subject of bone aneurysms or malignant bone cysts was first discussed in Progressive Medicine for December, 1913, p. 298. In 1910⁷⁷ I reported my presonal experiences. Gaylord⁷⁸ was the first to give a comprehensive report in American literature. The term bone aneurysm dates back to 1769, and was based on autopsy findings of a large blood cavity, and expanded bony shell and a narrow zone of tumor

tissue.

The patient reported in Progressive Medicine for December, 1913, p. 300, Figs. 68, 69 and 70, has remained well since the amputation in 1912, now six years. This was the first recorded case of a cure. In 1916,711 reviewed some cases reported in the literature. One of the cases reported by Royce is of special interest, because there was pulsation. The tumor involved the end of the clavicle, and, although small, the bony shell on the superior and outer surface was destroyed.

Mysochondrosarcoma. In the development of bone, cartilage may be displaced either beneath the periosteum or somewhere in the central portion of the bone. We must therefore bear in mind that now and then a marrow tumor giving rise to a definite bony shell may be due to the growth of an island of cartilage, and this tissue may produce either a benign chondroma or myxochondroma, or the latter may change into

i sarcoma.

Up to the present time in my recorded cases these tumors have been large and there has been present large masses of tumor tissue, both in the marrow cavity and through a perforation of the cortical bone, have

Annals of Surgery, August, 1940.
 Probert, Ssive Medicine, December, 1946, p. 362.

given rise to a periosteal growth. So it was difficult to tell which was primary. This is illustrated in a patient, a male, aged seventy years, who, three weeks after a wrench of the shoulder, some fourteen months before operation, observed a swelling at the insertion of the deltoid muscle. This grew until the upper half of the arm was irregularly expanded, and on palpation not only areas of bone but areas of soft tumor tissue were felt. In 1895, Halsted performed a shoulder-joint disarticulation without exploratory incision. This patient lived until 1908, thirteen years, and died at the age of eighty-three years of other causes. Microscopically, the tumor was a sarcoma with many myxomatous areas and here and there cartilage.

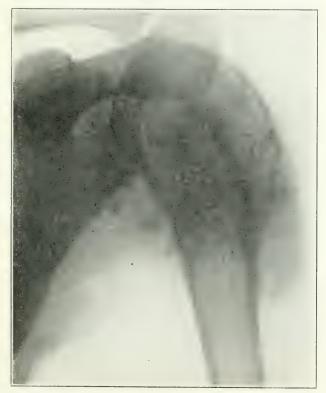


Fig. 52.—Myxosarcoma in tuberosity of humerus.

In this case the bony shell had been destroyed before there had been much expansion. The marrow tumor began in the head of the bone and extended down to the junction of the lower and middle third. Undoubtedly in this case if an x-ray had been taken after the injury there would have been revealed a small marrow shadow near the head of the bone, with a distinct bony shell. It is interesting to recollect that the first recorded case of bony cyst by Virchow was an autopsy specimen in which, in the head of the humerus, there was found a cavity, in the wall of which was an island of cartilage. On this single autopsy finding, Virchow concluded

that bone cysts were due to the liquefaction of a preëxisting cartilage area. This has been disproved by subsequent evidence. I am inclined to believe, however, that we will from now on see more early marrow tumors, and that in them we will find either cartilage or myxomatous tissue, or remains of such tissues with areas of sarcoma. Left alone, the sarcoma tissue in many instances obliterates the evidence of the pre-existing island of cartilage and may even lose its myxomatous stroma.



Fig. 53.—Myxosarcoma.

Fig. 52 is an x-ray of a myxosarcoma involving the upper end of the humerus, chiefly the greater tuberosity. If we look at the shadow in the humerus only we get the impression of a lesion confined to the bone. But there is present in this picture in the angle between the shaft of the humerus and the scapula a shadow which indicates involvement of the periosteum and soft parts. The surgeon in this case at the exploratory incision diagnosed giant-cell tumor and resected the upper end of the humerus, transplanting into the defect the upper end of the fibula (Fig. 53). In three months there was local recurrence leading to an amputation at the shoulder-joint and a few months later a shoulder-girdle amputation which did not result in a cure. The patient was a

colored man, aged thirty-seven years; the first symptom was pain in the right shoulder; this was two years before the first operation. Without any complete examination, it was diagnosed and treated as rheumatism. Then the joint became restricted in motion. Seven months before operation, without an x-ray study, attempts were made under anesthesia to move the joint. At that time there was no evidence of a swelling, but undoubtedly an x-ray would have shown the marrow lesion. Following the trauma, the swelling at the shoulder appeared. On exploring the tumor there was a note as to the preservation of the bony shell; it looked red. This may have been due to hemorrhage, because the appearance of the tumor tissue received in the laboratory was not red, but



Fig. 84

coarsely granular, soft tissue resembling fish-roe or tapioca. Microscopically, it was myxoma and myxosarcoma. In this case a more thorough investigation of the x-ray and a more careful inspection of the tumor tissue exposed at the exploratory incision would, in my opinion, have led to a shoulder-girdle amputation in the first instance. Indoubtedly, an x-ray picture at the time of the first symptom of pain, two years before operation, would have revealed a shadow in the tuber-osity and led to an operation which undoubtedly would have accomplished a cure without the loss of the limb.

Fig. 84 is an x-ray of a pure myxoma originating in the shaft of a metacarpus, with preservation of the bony shell. Undoubtedly this

will be the picture of the early benign and malignant myxochondroma arising in the marrow cavity of the different bones. The x-ray picture is not unlike a bone cyst or a giant-cell tumor.

It is rather interesting to note that the most common tumor arising in the marrow of the short pipe bones is a pure myxoma, although giant-cell tumors and bone cysts have been reported.⁸⁰

 $^{^{80}}$ Annals of Surgery, August, 1910, and Progressive Medicine, December, 1916, p. 351, Figs. 83 and 84, and Ibid., pp. 73, 336.

PRACTICAL THERAPEUTIC REFERENDUM.

By H. R. M. LANDIS, M.D.

Adrenalin (Epinephrin). The use of epinephrin to ward off and relieve all disagreeable or alarming effects of salvarsan and its substitutes is highly recommended by Milian. In order to prevent the fever, headache, vomiting, diarrhea, etc., which at times follows the intravenous use of salvarsan, Milian gives 2 mg. of epinephrin in a little water by mouth one hour before and again five minutes before the injection. This dose is repeated an hour after the injection. He also advises the administration of 1 mg. by mouth night and morning on the four following days when the patient shows evidences of being intolerant to the salvarsan. To ward off the immediate effects of salvarsan, such as congestion of the face, vomiting, distress, etc., he gives five minutes before the injection 1 mg. of epinephrin subcutaneously and 0.5 mg. intramuscularly. The signs that the patient is duly under the influence of the epinephrin are: blanching of the face, a rise in the arterial pressure, tachycardia and a generalized tremor. The pallor of the face is the most important.

The French Dispensatory states that not more than 1 mg. of epinephrin should be used in twenty-four hours. This is a very small dose and is frequently exceeded. An instance of remarkable tolerance has been reported by Nolf and Fredericq.² They state that in a case of Addison's disease with grave symptoms of suprarenal insufficiency, there was given 10.5 mg. of epinephrin in four and a half hours; this included 2 mg. subcutaneously and 8.5 mg. intravenously. No sugar appeared in the urine, and the blood-pressure was not brought up quite to normal even after this. The following days 6 and 4 mg. were given. There were no signs of intolerance at any time, even though to attain a therapeutic effect these large doses were needed. By watching the blood-pressure, the authors believe that very large doses can be used in emergencies, such as acute suprarenal insufficiency under chloroform anesthesia or in cases of gaseous gangrene or other hypotony of infec-

tious origin.

Sergent³ also advocates large doses of adrenalin in suprarenal insufficiency. As these patients often suffer from persistent vomiting or gastric intolerance, the drug must be given hypodermically. Under these circumstances, he gives 6 or even 8 mg, of the pure drug in twenty-four hours. As an example of the extraordinary amounts which may be taken, he cites the case of a drug clerk who swallowed 20 c.c. of a 1 to

¹ Paris Médical, February 2, 1918.

² Archives Médicales Belges, August 26, 1917.

³ Jour, de Médecine et de Clinique Pratiques, October 10, 1917.

1000 solution of adrenalin hydrochloride with suicidal intent. As nothing transpired, he took, fifteen minutes later, an additional 15 c.c. Two hours later he developed severe headache, stiff neck and nosebleed. At the hospital he was bled 75 c.c. because of high blood-pressure and later given emetics and inhalations of amyl nitrite. Aside from some bloody expectoration (he was tuberculous) no ill effects resulted.

For the prevention and the relief of sea sickness, Naamé⁴ advises the use of epinephrin. He administers it as follows: 5 or 6 mg, are divided into three doses and given an hour or half an hour before meals. A

small dose of epinephrin will also relieve car sickness.

Naamé also advocates the use of epinephrin in the treatment of cholera which he believes is always associated with acute suprarenal

insufficiency.

Benedict⁵ considers adrenalin as a most useful drug because of its action in certain forms of hemorrhage and also because it checks certain manifestations of hyperthyroidism and hyperchlorhydria. In addition,

it is of service as a circulatory tonic.

The effect of adrenalin upon muscular fatigue has been studied by Gruber. He states that in the fatigued unaltered nerve and muscle, adrenalin may increase the height of muscular contraction by a two-fold action—by improvement of the blood supply (vasodilatation) and by its chemical action upon some substance in the muscle. In a muscle in which the nerve is cut and stimulated, adrenalin in small doses, however administered, does not better the circulation, and must, therefore, produce its effect of increasing the height of muscular contraction by its chemical (specific) action alone.

The following three processes which normally go on in muscle may be greatly accelerated by adrenalin, and it is not improbable that one or all of these will finally prove to be the way in which adrenalin produces its effects: (1) The conversion of glycogen into sugar. (2) The reconversion of lactic acid into sugar (transformation of fatigue products). (3) The oxidizing of lactic acid into carbon dioxide and water (destruc-

tion of fatigue products).

Alcohol. The status of alcohol as a remedial agent continues to be a therapeutic storm center. This has been intensified considerably by the decision of the House of Delegates of the American Medical Association to exclude the drug from the Pharmacopæia. There can be no doubt that the use of alcohol within the past decade has been considerably restricted. Where it was once universally employed it has now either been completely abandoned by some, or greatly restricted by others. Giving it up altogether or restricting its use, however, is not sufficient proof that it is, and always has been, useless as a therapeutic agent. Many, if not all, of the great clinicians of the past used alcohol freely and in large doses for a variety of conditions, particularly the acute infections. The wisdom of these men in many particulars is constantly being recalled. Not infrequently new discoveries are found to have

⁴ Paris Médical, November 17, 1917.

Therapeutic Gazette, December, 1917.
American Journal of Physiology, July 1, 1917.

ALCOHOL 317

been known, forgotten, and again rediscovered. Certain therapeutic procedures in the past have been carried to excess, discarded, and, after a period of years, brought back into use. Venesection is a notable instance. It would seem that alcohol is in the same predicament. There is this difference, however: Alcohol, as Williams⁷ has pointed out, would probably not be the cause of difference among medical men if the question was one of therapeutics alone. There has been injected into the argument, however, a political, moral, ethical, financial, and religious aspect as well. As a result, practically all of the medical opponents of alcohol are biased by one or two, or all, of the above-quoted factors.

Hare⁸ has also emphasized the vital importance of keeping the moral aspect of the question carefully separated from its employment as a drug. He also emphasizes the fact that the use of alcohol by healthy persons is as widely separated from its use by certain people who are

ill as it is possible for two questions to be.

In a second editorial article, Hare⁹ again emphasizes the well-established clinical fact that in certain types of sepsis and other infections, and at times in typhoid fever, in pneumonia and in diabetes, alcohol has just as definite and clearly defined a field of usefulness as morphine or cocaine have when they are properly employed. It would seem, therefore, that in so far as their therapeutic use is concerned it would be as illogical to suppress one as the other. Furthermore, in those whose metabolism is disordered or disturbed, as in many diseases, alcohol prevents the breaking down of highly organized protein tissue and fats

by itself providing heat and energy.

One of the most debated points regarding the drug is the question, "Is alcohol a food or a poison?" The Central Control Board of England came to the following conclusions: (1) Alcohol is undoubtedly a food, in the sense that its combustion in the body can supply a considerable part of the energy needed by the organism. (Hare states that it is for this reason that alcohol is useful in many cases of exhausting fevers, since it is readily oxidized and the combustion processes of fever burn it up more readily than in health.) (2) Unlike other foodstuffs, it cannot be stored in the system in altered form, to be used as required, but remains as alcohol in the blood and tissues, on which, if present in excessive amount and over prolonged periods of time, it exercises a deleterious influence. (3) By reason of this latter characteristic, alcohol cannot safely be used as a large element in the diet without risk of injury to health, and it is on this account, and also because of its disturbing effect on nervous functions, that makes it quite unsuitable as a staple food for industrial workers. (4) Its action on the nervous system, which is the chief raison d'être of the ordinary use of the alcoholic beverages, in health and in disease is, with the possible exception of its effect on the respiratory center, essentially narcotic and not stimulant. (5) The moderate use of alcohol by the average normal adult is physiologically unobjectionable, provided that it is limited to the consumption of beverages of

9 Ibid., July, 1918.

Medical Record, October 20, 1917.
 Therapeutic Gazette, April, 1918.

adequate dilution, taken at sufficient intervals of time to prevent a

persistent deleterious action on the tissues.

Kent, 10 in a consideration of the question of alcoholism and its relation to fatigue, states that the true cure for the condition is the provision of decent surroundings in the factory and the home, adequate wages, leisure and relaxation, clubs, recreation rooms, indoor and outdoor games, in short, the elements of a healthy, full and interesting life in place of a mere existence without interest, without pleasure and with-

out hope.

In spite of repeated warnings in the past, instances of wood alcohol poisoning continue to be reported. Robinson¹¹ reports a case of blindness following exposure, for a few hours daily, to a commercial preparation (colorite) used in dying hats. Gettler and St. George¹² report 6 fatal cases of wood alcohol poisoning. They conclude that physicians and health officers should warn the public of the dangers existing in preparations which may be applied to or introduced directly or by inhalation into the body. European authorities have shown that the denatured ethyl alcohol serves every purpose in medicine and in the arts as well as wood alcohol, or better. They suggest, therefore, that legislation be enacted bringing about the prohibition of the sale of wood alcohel for domestic purposes, similar to laws now obtaining in England and Germany.

Antimony and Tartar Emetic. In reporting 10 cases of leishmaniosis, Quintana and Etcheverry¹³ state that the use of antimony and potas-

sium tartrate was most effective.

In the treatment of kala-azar and leishmaniosis with tartar emetic, Christopherson¹⁴ advises, for intravenous use, the employment of a small needle and small amounts of fluid. Stronger solutions than 0.5 grain to 20 minims of distilled water are liable to be irritating. For convenience, 1 grain of tartar emetic to 40 minims of sterile salt solution or distilled water can be made up and kept in a flask. As a routine treatment, 20 minims of such a solution may be given intravenously, and, if this is well tolerated, may be increased to 40 minims on the following day and then every other day increasing 10 minims each dose until 2 grains is reached. This should be continued for two months and then once a week for some time. Christopherson gives 3 grains as the maximum dose. In kala-azar patients the skin changes from the dark. dirty, dry appearance characteristic of these individuals to the normal, moist, sleek, supple condition. In addition, the weight increases and the temperature falls.

Longs¹⁵ has had excellent results in the treatment of infantile kalaazar with antimony and potassium tartrate. He states that the most optimistic statistics mention only 10 per cent, recoveries among children, and in his locality the proportion is only 4 per cent. Among 20

¹⁰ Lancet, July 28, 1917.

Journal of the American Medical Association, January 19, 1918.

<sup>Revista de la Asociación Medica Argentine, September, 1917.
Journal of Tropical Medicine and Hygiene, October 15, 1917.
Pediatria, Naples, August, 1917.</sup>

children treated with antimony and potassium tartrate, he obtained cures in 17. These children were given the complete intravenous treatment. In the cured cases the children showed no recurrence after three months or more. In other cases the treatment had to be abandoned, in some instances because of objections on the part of the mothers to the intravenous method, and in other instances children died of acute intercurrent infections. Rectal and intramuscular injections are far less effectual than the intravenous. Longs treated 6 children by one administration, but only 4 of the 6 could tolerate the drug in this way. Two were apparently cured after taking a total of 0.59 and 0.63 gm. respectively.

The intravenous use of tartar emetic in the treatment of malaria is reported by Hughes¹⁶ and Falconer and Anderson.¹⁷ These observers treated cases representing all types of infection. A 10 per cent. solution of the drug was employed. In Hughes's experience effect on the malarial parasite was noticeable only when the tartar emetic was given in toxic doses. He concludes, with Greig, that the drug appears to be rather a general protoplasmic poison than a specific poison for the malarial parasite. Falconer and Anderson found that neither in the subtertian cases nor in the benign tertian cases was any marked clinical improvement noted, and certainly in the benign tertian cases the tartar emetic did not appear to exert any effect whatever on the parasites. These results are in agreement with those of Low and Newham, mentioned in last year's review, and which led the last-mentioned observers to abandon this method of treatment.

Arsenic. The difficulty of getting medicinal agents into contact with the meninges is recalled by Barbat.¹⁸ He believes that by reducing the intraspinal pressure we may also increase the permeability of the meninges. If, therefore, the greater portion of the cerebrospinal fluid is removed, it must create a marked congestion of the meninges, and if the capillaries are dilated they must permit the passage of their contents with greater freedom. Whether this hypothesis is correct or not, Barbat states that he has been able to demonstrate definitely that in 25 out of 26 cases of paresis and tabes, arsenic was found in the cerebrospinal fluid twenty-four hours after its intravenous administration, if the spinal canal is tapped almost dry shortly after salvarsan or a similar product is given.

His technic is as follows: "The patients were given intravenous injections of either salvarsan, neosalvarsan or arsenobenzol. Within twenty minutes the spine was tapped, and the fluid was allowed to run until it barely dropped, the quantity varying from 30 to 60 c.c. The fluid was collected in two portions. The first was tested for colloidal gold, Wassermann, Pandy, Nonne and Noguchi reactions, and the second portion for arsenic. In 10 cases 26 c.c. of blood were withdrawn within half an hour after the administration of the arsenic. This was allowed to clot, the serum was removed, and both clot and serum were tested

¹⁶ Indian Medical Gazette, February, 1918.

¹⁷ Lancet, November, 1917.

¹⁸ Journal of the American Medical Association, January 19, 1918.

for arsenic. Twenty-four hours after the spine was tapped, a second tapping was done, removing at least 10 c.c., though usually twice that amount was removed. This fluid was also examined for arsenic.

"Analyses showed that the blood serum contained more than five times as much arsenic as the clot contained, and that it averaged only about eight parts per million. This fact proved that within half an hour after the administration of 0.4 gm. of salvarsan, 75 per cent. is fixed in the body cells. The second portion of spinal fluid, which was withdrawn immediately after the administration of the salvarsan, showed 31 per cent. arsenic-free and 27 per cent. with a trace, while 42 per cent. gave an average of 0.2 part per million. The spinal fluid withdrawn twenty-four hours later showed 1 case out of 26 arsenic-free, 2 cases with a trace, and an average of 0.25 part per million in the remaining 23 cases.

"These figures would indicate that arsenic can be made to pass into the spinal fluid in more than 96 per cent. of patients suffering from tabes

or paresis."

Barbat cites instances among the group treated in which marked improvement occurred, not only in the relief of certain symptoms, such as the lightning pains in tabes, but also in the general condition.

The use of sodium arsenate in the treatment of soft chancres and the resulting bubo is recommended by Goubeau.¹⁹ In the treatment of the chancre, sodium arsenate, in a 2 per cent. alcohol (95 per cent.) suspension, is painted on once daily. If there is a complicating bubo it is injected, on alternate days, with 1 or 2 c.c. of a 1 per cent. aqueous solution of the sodium arsenate. Goubeau states that this method shortened the course of the disease to nineteen days in 149 cases without bubo; if seen early, a cure was effected in from four to ten days.

Rieger and Solomon²⁰ have studied the arsenic-content in the cerebrospinal fluids (123 in number) collected at random from neurosyphilitic patients, at arbitrary intervals following the intravenous injection of from 0.3 to 0.6 gm. of arsphenamin. Their conclusions are as follows:

1. Of 123 cerebrospinal fluids collected at intervals ranging from five minutes to twenty-three hours after intravenous injection of from 0.3 to 0.6 gm. of arsphenamin, 38 showed appreciable amounts of arsenic.

2. The largest amount found was 0.6 mg, of arsenous oxide in 1.0 c.c. The average amount was 0.18 mg, per cubic centimeter. The shortest interval at which arsenic was found was thirty minutes: the longest two hours.

3. With successive injections, the fluids in general show progressively smaller amounts of arsenic for the same time interval.

4. In general, those patients consistently showing the larger amounts of arsenic in their fluids made the more rapid improvement.

5. It is suggested that intravenous injections of divided doses at oneor two-hour intervals would prove more effective in maintaining a high concentration of arsphenamin in the blood for longer periods, and thus possibly allow increasingly greater amounts to pass into the perivascular spaces.

Bull, de l'Académie de Médecine, Paris, September 4, 1917.
 Journal of the American Medical Association, July 7, 1918.

In examining the teeth of 244 persons under arsphenamin (neosalvarsan) treatment, Keitchevsky and Séquin²¹ found that 43 had pronounced pyorrhea and 62 slight evidences of pyorrhea. persons who had completed the course, they found spirochetes only in 3. In 24 untreated cases of pyorrhea, the spirochetes were found to be numerous in all but 2. In fully 50 per cent. of 110 before treatment with arsphenamin, the secretions taken from the gums swarmed with these organisms. As a result of their experience, they believe that the treatment of pyorrhea should be by intravenous injections of neosalvarsan plus local treatment. They have also injected the neosalvarsan

directly into the pus pockets, in solution or as a powder.

Aspirin. An instance of chronic aspirin poisoning is reported by Stiell.²² A woman, aged fifty years, a sufferer from rheumatoid arthritis, was in the habit of taking 10 grains of aspirin twice daily for a period of seven years. During the first six years she did not exhibit a single untoward symptom. The first evidence of intolerance for the drug was in the form of an intractable simple conjunctivitis which the patient described as feeling as though there was sand in the eyes. There was a well-marked hyperemia of both palpebral and ocular conjunctiva, a slight degree of chemosis and considerable lacrimation. A week later a severe urticaria developed. Following the appearance of the urticaria the general symptoms became alarming. The patient became weak from insomnia, diarrhea, and vomiting. In addition, there was a marked edema of the tongue and fauces, causing difficulty in swallowing, and vision was also interfered with because of extreme palpebral edema. The urine gave an intense bluish reaction when tested with liquor ferri perchloridi. A diagnosis of chronic aspirin poisoning was made, and the drug was immediately withdrawn. The patient was given 5 grains of ichthyol and a mixture containing liquor arsenicalis, tineture of belladonna and calcium lactate three times daily. Bromides were given in large doses at night. At the end of seven weeks the patient had recovered. Stiell states that an interesting feature of the case was the fact that from the onset of the urticaria all traces of the rheumatism. aside from the bony deformities, had disappeared.

Atropine. Pulmonary hemorrhage is always a trying condition to treat because of the failure of the great majority of drugs recommended to exert any influence on the bleeding. Minor²³ states that atropine has rarely failed him in this condition. The drug should be given hypodermically and in large doses ($\frac{1}{3}$ to $\frac{1}{25}$ of a grain). This dose should not be repeated under six hours as it easily paralyzes the bladder and,

at times, the intestines.

Balsam of Peru. From time to time various remedies are suggested for the treatment of scabies instead of the time-honored sulphur ointment. Among these alternative drugs is balsam of Peru. Allan²⁴ calls attention to the fact that some ten or twelve years ago there were

<sup>Presse Médicale, May 13, 1918.
Practitioner, September, 1917.
Therapeutic Gazette, May, 1918.</sup>

²⁴ Practitioner, November, 1917.

recorded in the German medical literature a number of cases in which serious symptoms indicative of acute nephritis followed the use of the balsam. For instance, in a case referred to by Richarty, 25 a patient. aged sixteen years, was treated with 10 per cent, balsam of Peru, there being three applications altogether. Acute nephritis was produced, and death occurred in fourteen days. Being familiar with this untoward effect of balsam of Peru, Allan decided to watch carefully the effect of storax in cases of scabies in children. He employed the following formula:

Styracis .									1	ounce
Olei olivæ			-							ounce
Cera flava									2	drams

This ointment was rubbed into the affected parts twice daily. After two or three days' use of the ointment, albumin appeared in the urine. This, however, was transitory and disappeared within a day or two of the storax being stopped. At the time of his first observations, 5 cases reacted in this way and since then he has had a number of opportunities to note the same effect after both the use of storax and balsam of Peru. Allan does not mean to prohibit the use of these balsams in the treatment of scabies but desires to emphasize the necessity of caution when they are employed. In obstinate cases of scabies which resist the sulphur treatment, storax or balsam of Peru may be used up to the time when a transient albuminuria is produced. In conclusion, he advises against either storax or balsam of Peru in the treatment of infantile scabies if for any reason the urine cannot be examined daily.

Benzol. A few years ago benzol was very favorably considered in the treatment of leukemia. Vaquez and Yacoel²⁶ report 3 cases of leukemia in which they employed benzol with good results. They also tabulate the results obtained by eleven other clinicians. All of these cases showed improvement in the general health, a reduction in the size of the spleen and in the number of white cells, and an increase in the number of red

blood corpuscles.

Recently, there has been a tendency to avoid the use of benzol in the treatment of leukemia. While it is true that the drug causes a marked diminution of the white cells, it so interferes with the bloodmaking apparatus that the red cells may also be reduced. Some clinicians now employ the drug in much smaller doses than formerly in the hope that it may affect the white cells and not interfere with the other blood elements.

In an experimental study, Weiskotten and Steensland²⁷ found that four rabbits exhibited periods of spontaneous infection coinciding with periods of exposure to the action of subcutaneous injections of an olive-oil-benzol mixture (equal parts). With daily subcutaneous injections of this mixture there developed evidences of active acute infection, which were not present before the injections were begun. In two rabbits old infections, present before the injections, were lighted up.

Menchner med. Wehnsehr., May 8, 1916.
 Bulletins de la Société Médicale des Hôpitaux, January 25, 1918.
 Journal of Medical Research, November, 1917.

In none of the rabbits did there occur diphasic leukopenia, and in only one aplasia of the marrow, such as are produced in similarly treated non-infected rabbits.

Benzyl Alcohol. In an experimental and clinical study of this drug, Macht²⁸ has found it an efficient *local anesthetic* when administered in aqueous solution. It is soluble up to 4 per cent. in normal saline solution. Macht emphasizes the following points: (1) Its low toxicity as compared with that of the commonly employed local anesthetic alkaloids, of which cocaine is the standard representative. (2) The ability of the organism to metabolize it and excrete it in an innocuous form. (3) Its high boiling point and the consequent ease of sterilization. (4) The comparatively low price of the drug and its ease of production.

Bismuth. In addition to dietetic measures in the treatment of *chronic hyperacidity*, heartburn and sour regurgitation, Fischbein²⁹ states that alkalies are indispensable. The following prescription will be found useful:

R—Mentholis .					,											1.0	
Magnesii usta																	
Sodii citratis																	
Bismuth subca	arbo	nati	is													20.0	
Sig.—One-half teas	spoc	nfu	l in	а.	little	wa	ter	hali	fan	ho	ur	to	one	ho	ur a	ıfter mea	ıls.

He states that the light magnesia and sodium citrate are preferable to sodium bicarbonate, as the latter causes distention because of the carbonic acid it generates.

Bromoform. This drug is recommended from time to time in the treatment of whooping cough. While Allan³⁰ does not assert that bromoform will be found effective in every case of pertussis, he believes that in the majority of cases it will be found to be an efficacious remedy if administered properly. It is his practice to give 1 minim of bromoform every four hours to an infant one year of age. To a baby six months old, half this dose is given and to an infant two years of age, the age for the first year is doubled. He generally found that with older children a smaller dose was quite as effective; for example, to a child aged four years, $2\frac{1}{2}$ to 3 minims might act just as well as the full maximum dose of 4 minims. Although the dosage is usually given as 1 minim for each year, Allan believes that in every case the endeavor should be made to obtain the maximum effect with the minimum dose. Most observers advise the use of bromoform uncombined with other substances. Allan, however, prefers combining the drug as follows:

Bromoform Spiritus chloroformi								
Mucilaginis								
Aguse anethi						(1.	8. 310	.01

It is often advisable to add 1 minim of tincture of strophanthus to each dose, and, in addition, some flavoring agent may be used if thought desirable. The mixture will not keep indefinitely and not more than

²⁸ Journal of Pharmacology and Experimental Therapeutics, April, 1918.

<sup>Boston Medical and Surgical Journal, January 17, 1918.
The Prescriber, August, 1917.</sup>

enough to last twenty-four or thirty-six hours should be made at one time; or better still, the amount needed for the succeeding twenty-four hours should be made up each morning. The mixture should be thoroughly shaken before using and the dose measured accurately and not by the household teaspoon which varies too much in size. As long as the paroxysms are severe, the dose should be given at four-hour intervals. When the attack begins to abate, the mixture may be given at six-hour intervals, then three times daily and finally twice a day.

Calcium Carbonate. In the medicinal treatment of gastric hyperacidity, Boos³¹ states that preparations containing proteolytic ferments, such as pepsin, papain and pancreatin, have been much in vogue. He believes, however, that the use of these substances is irrational since the pepsin is already present in abnormal amount. Not only is there an excess of hydrochloric acid, but, at the same time, the pepsin is increased, with the result that digestion is really more vigorous than in the normal individual. Boos believes that what these patients need is neutralization of the acid, with consequent relief from its irritant action on the gastric mucous membrane. While bicarbonate of soda gives this relief very promptly, its neutralizing effect does not last long as it is carried out of the stomach by peristals before the excessive acid formation has ceased. In order to obtain more lasting neutralization, it is necessary to use insoluble compounds, such as carbonate of magnesia and calcium, and the oxides of magnesium. Boos finds that in nervous hyperacidity with a tendency to loose bowels, calcium carbonate develops a threefold action; it neutralizes the excess of acid, it stops the looseness of the bowels, and the absorption into the system of the calcium chloride which is formed in the stomach, produces a distinct quieting effect on the patient's nervous condition. Boos employs a mixture of calcium. carbonate and magnesium carbonate or oxide in the form of a powder, the quantity of each depending upon the state of the patient's bowels. For hyperacidity, one powder is given thirty to fifty minutes after each meal. If symptoms occur earlier, i. e., while they are still eating or immediately after eating, he gives a little sodium bicarbonate just before the meal. For the morning headache of hypersecretion, he gives another powder at bedtime.

Camphor. The hypodermic use of camphor in the form of camphorated oil has long been recognized as a valuable stimulant when a rapid action is desired in cases of cardiac failure. Its use in cardiac cases has been restricted largely to emergencies. Sigerist³² reports that the long-continued administration of camphor to rabbits did not seem to impair in any way the functioning or the structure of the heart, but rather to increase its functional capacity. It did not, however, render the heart more resistant to phosphorus poisoning or diphtheria toxin, and did not aid in throwing off the effect of ether. Zanyger has found that small doses of camphor are very useful in keeping up the tone of the heart in cases of chronic myocarditis. During the acute phases, digitalis, or other cardiac tonics are needed, but, when the heart has steadied down, ten

Boston Medical and Surgical Journal, October 4, 1917.

¹² Correspondenz-Blatt f. Schweizer Aerzte, December 22, 1917.

to fifteen drops of the spirit of camphor two or three times a day for months at a time, seem to aid materially in keeping up the balance of

the heart. He administered the camphor on sugar or in water.

Hitherto camphor has been looked upon as the last resource to prolong the life of a diseased or exhausted heart. For this purpose injections of camphorated oil have been employed in emergencies to counteract cardiac collapse in acute infective disorders or the threatened paralysis of the last stages of heart disease. Marfori³³ and his assistant, Leone, have found that the isolated mammalian heart, when poisoned by chloral so as to render the pulsations barely perceptible, could be rapidly restored to action by camphor, and, furthermore, that its action on the circulation was very characteristic, as it could be proved that small doses invariably caused a diminution of arterial pressure and at the same time increased the volume of the cardiac pulsation. Only toxic doses of camphor give rise to increased arterial pressure, accompanied by convulsive phenomena which seem to be independent of the vasomotor centers, as they are observed even during profound narcosis when these centers are rendered excitable. Marfori considers no other drug can compete with camphor in sustaining the activity of the heart and steadying the pulse in cases of chronic myocarditis, with cardiac insufficiency, and auricular fibrillation. He also noticed that the beneficial effects obtained were continued after the drug was suspended, but recommends systematic treatment for a long time. For this purpose one or two daily hypodermic injections of 0.10 grams are given in an oily solution. It may be given by mouth also. Marfori also believes that in valvular lesions, when disturbance of the pulmonary circulation and hypertension in the right ventricle predominate, camphor is the most rational and efficacious remedy. In conclusion, Marfori states that camphor must no longer be considered merely as a remedy in the hour of death, but rather as a drug which, when intelligently administered, is capable of producing beneficial results throughout the entire course of various cardiac and vascular diseases owing to its special properties, which are distinct from those of other heart drugs.

It has been pointed out in the *Lancet*, June 16, 1917, that inasmuch as liquid vaseline is easier to sterilize than olive oil, pharmacists have been tempted to utilize it in the preparation of camphorated oil. This practice is to be discouraged as instances have been reported in which extensive and obstinate indurations have followed the use of camphorated oil prepared from vaseline. Histological examination showed that the induration consisted in the main of inflammatory tissue containing numerous polynuclear cells. Hare points out that, in addition, the

vaseline probably prevents the absorption of the camphor.

Chaulmoogra Oil. Coghill³⁴ has obtained excellent results in the treatment of *leprosy* from the use of the formula recommended by Heiser, namely, chaulmoogra oil, 60 c.c., camphorated oil, 60 c.c., and resorcin, 4 grains. The mixture is sterilized by boiling. Coghill injected 2 c.c. of this mixture intramuscularly into the buttock and increased the dose 1 c.c. each week until 8 c.c. were given. As the latter amount caused

³³ Lancet, September 22, 1917.

³⁴ Annals of Tropical Medicine and Parasitology, August, 1917.

some discomfort, the procedure finally adopted was to inject as the maximum dose 6 c.c. twice a week. The most rapid and obvious effect was the healing of ulcers, many of them large and deep and of years' standing. Instead of employing chaulmoogra oil alone, or in the above combination, Rogers³⁵ has for several years employed the sodium salts of the fatty acids of chaulmoogra oil. In his last report, Rogers has employed the sodium salts extensively, giving well over 1000 intravenous injections without any ill-effects beyond temporary giddiness and headache and an occasional localized clotting in the vein.

The sodium salts of the fatty acids obtained from chaulmoogra oil are dissolved in water in a strength of 3 per cent., so that 2 c.c. contain 1 grain of the salts. This allows the ready calculation of the doses in either grains or fractions of a gram. The solution may be sterilized in an autoclave and 0.5 per cent. phenol added, or it may be phenolized first and heated on a water bath to 100° C. for twenty minutes.

Rogers begins treatment with at least half a grain in 1 c.c., and increases by 0.5 to 1 c.c. at a time until 2 to $2\frac{1}{2}$ grains in 4 to 5 c.c. is reached, provided severe giddiness is not produced. The injections may be given once or twice a week, and, on the other days, 2-grain pills or tablets of the drug may be taken by mouth after meals, beginning with one three times a day and increasing by one daily until ten or twelve are taken each day, so long as the digestion is not disturbed or giddiness produced. Occasionally, patients are able to take as high as 40 grains daily with advantage. In most of the cases the treatment was restricted to the intravenous injections alone. Subcutaneous injections do not produce reactions in the leprous tissues and are less effective than intra-

Rogers states that between one and two years were required to cause the lesions to disappear in the successfully treated cases. The lesions have disappeared in 50 per cent, of the cases treated within three years of the onset of the disease, including cases treated for only three to twelve months. In cases of from three to fifteen years' duration, only 25 per cent. cleared up under treatment.

The most active constituent of the oil has not yet been obtained in a pure state. The fatty acids are of two kinds: One with a meltingpoint of from 49° to 62° C. and the other with a lower melting-point (37° C). The higher melting-point preparations are the more active.

Chenopodium. The status of this drug as a vermicide has been firmly established. This is particularly true of the treatment of hookworm infection in which condition it has practically displaced thymol. An additional advantage which oil of chenopodium has over thymol at the present time is the cost, the former being by far the cheaper drug. In a comparative study of the effects of different vermicides, Darling, Barber and Hacker³⁶ have shown that chenopodium is by far the best of the drugs usually recommended for hookworm infection. These observations covered a period of about two and a half years in Java, the Malay Peninsula, and adjoining regions. In a comparative study of the

Indian Journal of Medical Research, October, 1917.
 Journal of the American Medical Association, February 23, 1918.

effects of betanaphthol, eucalyptus, thymol and oil of chenopodium, the percentage of worms removed by first or trial treatment was as follows: Betanaphthol; 26.7; eucalyptus, 46.9; thymol, 88.6; oil of chenopodium, 96.1. Given in medium doses, the oil of chenopodium proved to be the most efficient. They then made a series of observations, trying various doses and under varying conditions, of the effect of thymol and oil of chenopodium.

As to administration, they found that the soft gelatine capsules supplied in sealed tins by certain manufacturers were relatively inefficient. They, therefore, recommend that the oil of chenopodium be administered

in hard, dry, gelatine capsules, filled a few hours before use.

Darling, Barber and Hacker conclude from their studies that the half maximum dose (0.5 c.c., three times, or 1.5 c.c.) of oil of chenopodium is the treatment for recommendation as a routine vermacide. It does not have the toxic effects of the full dose, and two treatments have the very satisfactory result of removing 99 per cent. of all worms present. It has the additional advantage of a more uniform action, a greater effect on ankylostomas, and of being less unpleasant to take than thymol.

Thymol shows an advantage over this half maximum dose of oil of chenopodium in that, without producing toxic effects, the 90 grains' dosage produces a better result when single treatments are compared. This advantage disappears, however, when two half-maximum treatments

of oil of chenopodium are given.

Smaller doses compare unfavorably with a single half-maximum dose of oil of chenopodium. A dose as large as 90 grains of thymol, if administered indiscriminately throughout the population, would probably give rise to serious symptoms.

In an experimental study of the effects of oil of chenopodium, Zeigler³⁷

concludes as follows:

1. The oil of chenopodium on the market does not vary in potency.

2. The toxicity is not influenced by the age of the animal.

- 3. The absorption is more rapid from the stomach than from the intestines.
 - 4. Atropine antagonizes the depressant effect upon the respiration.

5. Small doses are non-toxic.

6. When oil of chenopodium is administered to dogs in salol-coated capsules, the absorption is delayed.

7. The cause of death in the dog when oil of chenopodium is adminis-

tered in toxic doses is an acute diffuse nephritis.

8. The failure to differentiate between drops and minims, and the failure to follow therapeutic doses with a purge, are probably the principal causes of the fatal effects seen in several cases of uncinariasis treated with this drug.

Hall³⁸ also emphasizes the importance of bearing in mind that a minim and a drop of oil of chenopodium is not at all the same thing. A casual test with a pipette shows over two drops to the minim, a given number of minims, therefore, constituting more than double the dose of the same

Interstate Medical Journal, October, 1917.
 Therapeutic Gazette, April, 1918.

number of drops. Darling, Barber and Hacks³⁹ always measure the dose of oil of chenopodium by a graduated pipette, not by the drop.

As already mentioned above the preferable and the safest dose seem to be 0.5 c.c. given three times (a total of 1.5 c.c.). Hall, 40 in commenting on the dosage, states that the maximum dose is that given by Keith, namely, three doses of 30 mimims each at hour intervals.

Heiser, in a discussion of Keith's paper several years ago, stated that Keith gives 10 minims each morning for three mornings, and then follows the last dose with castor oil after a two-hour interval, but Heiser, according to Hall, appears to have quoted Keith wrongly in this respect. The dose method attributed to Keith by Heiser has been recorded by several others, one of them recording a case of severe poisoning from this treatment.

McCulloch. 41 who prefers thymol, states that oil of chenopodium may be used if the thymol cannot be obtained. In view of the experiences given by Hall and by Darling, Barber and Hacker, his recommendations as to dosage of oil of chenopodium are not to be recommended. He advises a dose of 16 drops to an adult at two-hour intervals for three doses or the same dose on three successive mornings. The last dose to be followed by an ounce of castor oil with or without 50 drops of chloroform. Hall states that he regards this method of treatment, giving chenopodium every morning for three mornings with no purgation until the third day, as the worst of the methods so far proposed, for reasons already published by Hall and Foster, 12 i. e., that oil of chenopodium is distinctly constipating and should be given with a purgative rather than left for two twenty-four-hour intervals before purgation. Hall has found experimentally that the prompt administration of castor oil has a distinct protective value against the irritant and toxic properties of oil of chenopodium, saying the lives of dogs that were given doses found to be lethal when given without castor oil, and it appears, in Hall's experience, to be superior to any other purgative used with oil of chenopodium. On the other hand, Darling, Barber and Hacker¹³ preferred magnesium sulphate, believing it to be superior to castor oil.

Heiser⁴⁴ emphasizes the fact that recent investigations have shown that oil of chenopodium is one of the most effective remedies for hookworm and ascaris infection. It has also been used successfully for the commoner varieties of tapeworms and for encysted amebic dysentery. It is not free from danger, however, and a number of deaths following its use have now been recorded in Ceylon. On the other hand, there have been no deaths or untoward symptoms following its use in Sumatra, although the drug has been administered over 300,000 times. Heiser calls attention to the fact that the procedure in the two places differs. In Sumatra there are no dietary restrictions; no preliminary purgation takes place; castor oil is used as a purgative instead of magnesium sulphate; and the capsules are not filled until they are to be used.

43 Loc. cit.

⁴⁰ Loc. cit. "Loc, ett. ⁴⁸ Southern Medical Journal, December, 1917.

⁴² See Progressive Medicine, December, 1917. ⁴⁹ Military Surgeon, August, 1917.

The danger of poisoning from oil of chenopodium has been alluded to in previous numbers of Progressive Medicine. Hirst and Mills⁴⁵ report a fatal case of poisoning occurring in a pregnant woman. As there may be a certain amount of confusion as to whether the untoward symptoms which may occur under these circumstances, are due to the oil of chenopodium or to an attack of eclampsia, they give the following differential table:

GENERAL FEATURES.

Eclampsia. Prodromal symptoms as headache, albuminuria, vomiting, disturbances of the special senses, edema, high pulse tension.

Temperature high. Pulmonary edema common. Oil of chenopodium poisoning.

Absent, urine normal.

Not elevated. Absent.

CONDITION OF LIVER.

anemic necroses Hemorrhagic common.

Thrombosis of portal veins. Fatty degeneration of periphery of

General autolysis of liver occasionally. Hepatitis and perihepatitis hemorrhagica occasionally.

Generalized necrosis.

None. None.

Present. None.

Condition of Kidney.

Various forms of acute and chronic Acute degeneration, on evidence or preceding nephritic involvement. parenchymatous nephritis.

CIRCULATORY SYSTEM.

Ventricles full of slowly clotting blood.

Heart muscle fatty with small hemorrhages, necroses, and thrombi; friable. Subpericardial hemorrhages, sometimes. Pulmonary congestion and edema common.

Hemorrhages, common. Emboli, common.

Heart stopped in systole, ventricles contracted and almost empty.

Heart muscle normal.

None. None. None.

None found.

Salant, 46 in an article on the pharmacology of oil of chenopodium, considers the treatment of poisoning. If a large dose has been swallowed, lavage may be resorted to with beneficial results. If lavage is promptly carried out after the oil is taken, it may prove effective in preventing serious consequences, since the absorption from the stomach is slow. In experiments carried out with Livingston, Salant found that several hours may elapse before the evidence of absorption into the circulation could be obtained when the oil was introduced into the stomach of animals, the pylorus having been ligated previously. On the other hand, the absorption from the duodenum was found to be very rapid. In some of the experiments the introduction of oil of chenopodium into the duodenum was followed immediately by untoward symptoms. (These experiments are in direct contrast to those of Zeigler, 47 who states that absorption from the stomach is more rapid than from the intestines.)

As there is no known chemical antidote, Salant states that the treat-

45 China Medical Journal, November, 1917.

⁴⁶ Journal of the American Medical Association, December 15, 1917.

47 Loc. cit.

ment is symptomatic. Stimulation of the respiratory and circulatory systems is indicated. Zeigler⁴⁸ states that atropine antagonizes the depressant effect upon the respiration. Experimentally, digitalis and epinephrin were found to be excellent antagonists. The stimulating action of digitalis has been found to be very persistent, and may completely overcome the depression caused by the oil. Caffeine was also tried, but it apparently aided the action of the oil rather than retarded it.

Salant emphasizes the fact that while oil of chenopodium may be regarded as a safe remedy for patients in good physical condition, it should be used cautiously in poorly nourished and weak or neurotic individuals. A diet containing a liberal amount of fats and carbohydrates, fed at least several days before the treatment is instituted, may render the drug much safer. The routine administration of large doses of castor oil before and soon after the oil of chenopodium, should be given serious consideration,

as it may prove to be of prophylactic value.

Hall and Hamilton⁴⁹ also emphasize the importance of bearing in mind that the oil not infrequently acts as a gastro-intestinal irritant. As a result of their experiments, the gastro-intestinal irritation appears to be due to the constituents making up a fourth or less of the volume of the oil. We believe this indicates the use of the lighter fraction as an anthelmintic in preference to the entire oil in order to protect the patient against

the danger of gastro-intestinal irritation.

Chlorazene (Chloramin-T). After trying a variety of measures to sterilize the throat of diphtheria carriers, McCord, Friedländer and Walker⁵⁰ confined their efforts to the elimination of existing open throat lesions. Tonsillectomy was carried out in a number of cases with a quick termination of harboring diphtheria organisms in all cases. In addition, a systematic treatment with chlorazene was inaugurated. They employed an aqueous solution of 0.25 per cent. strength, used as a gargle three or four times a day. In certain cases the application was made by throat specialists to ensure reaching the more inaccessible points in the nasopharynx. The gargling was followed with an oily spray of dichloramin-T of 2 per cent. strength. They ascribe their good results in part to the chlorazene-dichloramin-T treatment and in part to the general painstaking systematizing of the entire care of such patients. Through the use of their method it has been possible to return the carriers to duty after an average of twenty-three days in the hospital.

Chlorine. In the treatment of diarrhea in infants, Roseberry⁵¹ administers the following every six hours for the first twenty-four hours and

then three times daily until the stools are normal:

R Aque entori											•			11[11
Quinina sulphatis														gr. §
Salol														
Mucilaginis tragacan	thæ	1											_	
Your chloroformi													ad	5j
Dose, 5ss to a child unde	rsix	1116	mtl	18.	and	pro	port	ion	ate	dos	(25)	to	older	· children.

⁴⁸ Loc. cit.

¹⁹ Journal of Pharmacology and Experimental Therapeutics, April, 1918.

Journal of the American Medical Association, July 27, 1918.
 British Medical Journal, December 15, 1917.

In addition, he uses the following:

\mathbb{R}	–Olei ricini –														f3j
	Olei olivæ .														f3j
	Tincturæ opii														mij
M	Sig -10 to 20	mir	nims	2 0	eeor	rdir	or t	0.91	ore.	twic	e d	lails	7		

M. Sig.—10 to 20 minims, according to age, twice daily.

In many cases, lavage of the bowel with normal salt solution was practised. In cases of collapse, Roseberg recommends a mustard bath followed immediately by the injection of 1.5 c.c. of pituitary extract which is repeated two or three times at four-hour intervals. An inunction of warm olive oil is also given to diminish the loss of heat from the skin. In mild cases, restricting the diet to albumen water and barley water were sufficient.

Cod-liver Oil. Hess and Unger⁵² call attention to the fact that codliver oil has been regarded for many years as the sovereign remedy for rickets. Owing to the high death-rate among negro infants in New York City and the known tendency of rickets to predispose to certain respiratory diseases, Hess and Unger determined to try the prophylactic effect of cod-liver oil. It was determined to give cod-liver oil to about 50 babies between the ages of four months and one year, and to select, wherever possible, infants of families in which other children had had rickets. Before the oil was given, a careful physical examination of the baby was made, and a history of the case taken, involving the diet of the baby and of the mother, the economic condition of the family, the length of time they had lived North, and any other data which might be of interest in the survey.

At the outset, before the oil therapy was instituted, a physical examination was made and repeated at the end of two months, four months and six months, when the test was completed. Their plan was to give infants under six months of age one-half teaspoonful of oil three times a day and to older infants twice this amount. It was found that almost all babies can take cod-liver oil, although it may disagree temporarily and may have to be discontinued for short intervals when there is digestive disturbance. Infants of two or three months tolerate the oil in halfteaspoonful doses, and younger ones may be given still smaller amounts. (It is worth remembering that the oil can be administered by inunctions.) They were able to prevent the development of rickets in more than fourfifths of the infants who received the oil for six months, and in more than one-half of those who were given it for four months. They consider this result as satisfactory when the cases are contrasted with 16 infants not receiving the oil; of this latter group, 15 showed signs of rickets. The social conditions of the treated and the untreated infants was the same. Furthermore, the cod-liver oil proved to be a more potent factor than breast-feeding in warding off rickets, as almost all the colored babies developed rickets, even though they were fed at the breast.

As a result of their experience, Hess and Unger recommended that dispensaries be formed in large cities in the negro and the Italian districts for the prevention of rickets. Such dispensaries do not have to be

⁵² Journal of the American Medical Association, November 10, 1917.

created at large expense. They can be instituted in connection with existing milk or baby welfare stations, where provision can be made for dispensing cod-liver oil. Whether it is necessary to use Norwegian oil is very doubtful; it is probable that a less expensive cod-liver oil will produce

equally good results.

Corpus Luteum and Ovarian Extract. The therapeutic value of ovarian extract, or of one of its component parts, has been thoroughly established. There is, however, considerable divergence of opinion as to the proper form to use. Furthermore, the exact part played by the ovary in influencing the bodily functions is not, as yet, clearly understood. Morley⁵³ emphasizes the need for more uniform methods in the preparation of ovarian extracts. As the result of special research work on the subject, he expresses the opinion that up to the present time no ideal method of preparation has been formulated, and, until this has been accomplished, standardization of the product will not be attempted.

The articles by Dannreuther⁵⁴ and Graves⁵⁵ illustrate the difference of opinion that exists as to the proper preparation. Dannreuther employed a soluble aqueous extract of the corpus luteum which he administered by intramuscular injections. It is put up in ampoules of 15 minims each. He controls the dosage rather by shortening or prolonging the intervals between the doses than by varying the quantity given at any one time. In cases of pernicious vomiting of pregnancy he states that it may be given daily, unless some manifestation of overdosage occurs. For almost all the other conditions wherein it is indicated, one dose every other day usually suffices, and the intervals may be lengthened as the symptoms decrease or the blood-pressure is lowered. His technic is simple. An all-glass syringe is best adapted for making the injections and it should always be sterilized by boiling. Local reactions are avoided by making the injections intramuscularly (preferably the deltoid). If the material is deposited deeply and the surrounding tissues are massaged for a few seconds, pain and subsequent tenderness seldom follow. No untoward effects have followed the injections.

Damnreuther has employed the aqueous solution of corpus luteum in about 50 cases. Among them were instances of functional amenorrhea in young unmarried women; vicarious menstruation; hyperemesis of pregnancy; post-operative ovarian insufficiency; and induced and physiological menopause. Within a short time striking facts were recognized: (1) The subjective symptoms, particularly vertigo and nausea, so often mentioned by patients ingesting the desiccated extract before establishment of toleration, are seldom noted. (2) Overdosing with the soluble extract is usually manifested by headache. (3) The desired results are more rapidly attained than after the internal administration of the ordinary extract. (4) After the influence of the aqueous extract has become apparent, the desiccated extract will maintain the improve-

ment.

Surgery, Gynecology and Obstetrics, 1917, vol. xxx.
 New York Medical Journal, October 20, 1917.

⁵⁵ Journal of the American Medical Association, September 1, 1917.

Graves,⁵⁶ on the other hand, disapproves the use of corpus luteum and prefers the extract from the whole ovary minus the corpus luteum. Among 19 cases, representing the menopause, dysmenorrhea, amenorrhea, etc., treated with desiccated corpora lutea of pregnant animals, toxic symptoms of a digestive nature were produced in all but two. The symptoms were invariably those of nausea and vomiting following one or two doses. (Dannreuther claims that the hypodermic use of the corpus luteum extract obviates the gastric disturbance.) Owing to the unfavorable results obtained with the corpus luteum alone, Graves tried the effect of whole pregnant ovaries minus the corpus luteum. In this instance the toxic effects were entirely absent and the results obtained were similar to those of the non-pregnant ovary, but, in general, more striking. This was especially true in the treatment of vasomotor symptoms following hysterectomy.

Although Graves had employed ovarian therapy for a number of years, careful records were not kept in the beginning. Since the careful recording of results obtained 53 cases have been observed in which the whole ovary of non-pregnant animals and including the corpus luteum has been

employed.

The following conditions were treated: Vasomotor disturbances of the natural and artificial menopause, general debility, furunculosis of the external genitals, external genital discomfort from senile atrophy, amenorrhea, dysmenorrhea, oligomenorrhea, irregular menses, menstrual headache, nausea and vomiting and sterility. The most striking results were obtained in the treatment of menopause symptoms and the circulatory disturbances of the external genitals.

In addition, a group of 34 cases were treated with the ovaries of pregnancy but without the corpus luteum. The conditions for which this substance was administered were the same as those mentioned above. The results were in general similar to those from the whole ovary, excepting that they were somewhat more constant and in many instances more

brilliant. Among his conclusions, Graves states that:

"Ovarian therapy, for its best effectiveness, should include at least the product of the interstitial cells. Preparations should, therefore, comprise the ovarian stroma, in order to take advantage of the atretic follicles.

"Preparations made from the corpora lutea of pregnancy proved too

toxic for practical use.

"Preparations made from the ovaries of pregnant animals, with exclusion of the corpora lutea, proved superior therapeutically to preparations of whole ovaries of non-pregnant animals that included the corpus luteum.

"Fresh preparations should be used and the capsules should be kept

in a cool place to prevent decomposition."

Digitalis. The extensive studies made of the action of the heart during the past decade have made it perfectly clear that the use of digitalis should be determined by the condition of the heart muscle. The presence of a valvular defect, as indicated by a murmur or murmurs, does not necessarily mean that the patient should be given digitalis. If the lesion is well compensated, digitalis is most certainly not indicated; and even with the first evidences of failing compensation, digitalis is not necessarily indicated; rest in bed may be all that is needed. Long before we were in possession of our present knowledge of the arrhythmias, Hare was insistent in his teaching of students that digitalis was indicated only when the heart muscle was weak and that it should not be given to individuals with a valvular lesion providing the compensation was well maintained. While digitalis is always indicated in the presence of failing compensation, the most brilliant results are obtained in that form of decompensation associated with auricular fibrillation or auricular flutter.

In an article on the treatment of heart disease, Alsever⁵⁷ states that clinically the effects of the digitalis group (digitalis, strophanthus, squills, apocynum, etc.) is most powerfully effective in auricular fibrillation and auricular flutter and that the results obtained in these disorders have been so marked and so valuable as to give digitalis its justly great reputation in heart disease, other types of irregular hearts and hearts with normal mechanism also respond to digitalis but in a less

degree.

Carpenter's does not believe that digitalis should be given at first in cases of transient auricular fibrillation as the attack may subside spontaneously. If, however, it keeps up, and the dilatation of the heart becomes accentuated, with congestion of the liver and oliguria, fractional doses of digitalis should be given, especially if there is a valvular defect. When failure of compensation becomes evident, adequate doses of digitalis should be given and the subjective symptoms in addition should be combated by complete rest, with hot or cold applications to the heart region, and sedatives. When the stage of permanent arrhythmia is reached, digitalis must be given in small doses at regular intervals, increasing the dose when a murmur appears at the apex or other signs of dilatation of the heart appear.

Halsev⁵⁹ believes that the following conclusions are permissible: The gross irregularity of the ventricle in cases of auricular fibrillation can be controlled by digitalis if sufficient amounts of the drug are administered. The patient should be instructed to continue the use of the digitalis for the remainder of life and should be taught how to determine the amount of the dose necessary from day to day to control the heart-rate. The drug should be given in amounts sufficient to maintain the ventricular rate about 70 per minute when counted after rest in the late afternoon. The fibrillating auricle under a short course of digitalis may return to normal rhythm. In auricular flutter the aim of treatment with digitalis is to produce auricular fibrillation and then control the rate of the ventricle with digitalis, hoping in the favorable cases for a renewal of normal sequential rhythm.

Price. 60 in writing of the effects of digitalis in cases of auricular fibril-

Practitioner, November, 1917.

New York State Journal of Medicine, September, 1917.
 Archives des Maladies du Coeur, November, 1917.
 American Journal of the Medical Sciences, March, 1918.

lation, states that in the majority of instances the results are very good and in some cases extraordinarily good. Two causes of failure are: (1) Some cases of well-marked myocardial degeneration, and (2) cases in which there is accompanying pyrexia. In the latter, apparently the response to digitalis, if present at all, is, as a rule, very slight. The last named cause, pyrexia, has long been held to be true in regards to the action of digitalis. It will be recalled, however, that Cohn has shown by electrocardiograph studies in cases of pneumonia that digitalis does

exert its influence in the presence of fever.

In a quantitative study of the effect of digitalis on the heart of the cat, Robinson and Wilson⁶¹ found that when the vagi are cut the inversion of the T-wave occurs practically with the same dosage and to the same extent as it does when the vagi are intact, but the auriculoventricular conduction and the heart-rate are almost unaffected by digitalis intravenously injected to the lethal dose after the vagi have been cut. Robinson and Wilson believe that these findings indicate that the drug exerts its action on the heart of the cat both directly and through its effects on the vagus center. The direct action on the heart, as shown by the change in the T-wave of the electrocardiogram, is the first definite effect to appear when a constant percentage of the lethal dose of the drug is injected at intervals intravenously. They believe that the moderate slowing of the heart-rate which followed the injection of digitalis in vagotomized cats may be an indication of the stimulation of the peripheral end of the vagi.

In an article on the effect of digitalis in heart disease associated with the pulsus alternans, Windle62 states that in aged patients who once show this form of arrhythmia it can be certainly said that it will never again be absent for long; although it may be abolished for a time under digitalis, as the result of slowing of the heart and lessened calls on its strength for restoration of tonicity. If, however, the rate of the heart be again quickened, or if it be subjected to additional strain, as for example by exertion sufficient to induce breathlessness, the pulsus alternans is invariably reduced; moreover, it will inevitably recur in the course of the illness whatever means of treatment are adopted, and however favorable the patient's circumstances may be. Windle states that these results are to be expected from the fact first pointed out by MacKenzie, namely, that the combination of arterial disease and the pulsus alternans signifies severe degeneration of the heart muscle; although this may be for a time covert, and the pulse the only evidence of unsoundness of the heart, the condition is permanent and progressive and cannot be cured or retarded by drugs.

In cases of valvular heart disease of rheumatic origin with the pulsus alternans, the circumstances under which alternation in the pulse ensues are different in this respect, that it is never the first manifestation of an unsound heart, as it is in the aged with myocarditis and arteriosclerosis; it supervenes only in patients who are already the subjects of severe heart failure, and it signifies not the condition which is the primary cause of the heart failing, but a superadded embarrassment to the circulation. As a

Journal of Pharmacology and Experimental Therapeutics, January, 1918.
 Ouarterly Journal of Medicine, July, 1917.

rule, it first occurs coincidentally with increase in dilatation, the onset of dropsy, or other conditions, which it is unable to meet by full contractions. If the work of the heart is eased, by restoration of its tone, the disappearance of dropsy, etc., then the pulsus alternans ceases, and may remain absent so long as the factor which was its immediate cause continues in abeyance.

Windle says these considerations explain why alternation in the pulse is not usually persistent from the beginning to the end of rheumatic cases, and perhaps also why it is not so readily reinduced after its abolition under digitalis treatment as it is in the degenerative heart lesions of the aged. He has so far used digitalis in heart disease with

pulsus alternans in over 100 cases.

Although the indications for the use of digitalis are now reasonably clear, the *method of dosage* is the subject of considerable controversy.

White and Morris⁶³ advise the Eggleston method.

1. The strength of the preparation to be used is determined in "cat units" and from this the dose for man is calculated. The average amount of tincture administered orally required to produce full therapeutic effect (or minor toxic action) and given as above outlined, by the Eggleston method, is about 0.146 c.c. per pound of patient's body weight. (Example: Patient weighs 130 pounds; this multiplied by 0.146 equals 18.98 c.c. Since the infusion is correspondingly weaker in strength, for the infusion gives six and two-thirds times this quantity or 126.5 c.c.). The amount thus determined on is given in four doses within a period of eighteen hours by the following formula: The first dose is one-half the total amount to be given; the second, given six hours later, is one-half the remainder; and the third and fourth doses, given at six-hour intervals, are one-half the second dose in amount.

2. The method of Eggleston is followed immediately, or after one or two days, by what may be called tonic doses of infusion or tincture, given three or four times daily over a period of days or even weeks. These doses are usually 0.6 to 1 c.c. of the tincture, and 4 to 8 c.c. of the infusion.

3. The tincture or infusion is given in these so-called tonic doses without the previous administration of the larger Eggleston doses.

In the small series of cases studied by White and Morris, they found, in general, that digitalis administered after this method produced, in addition to the moderate slowing of the pulse-rate due to vagus effect

on the sino-auricular node, the following effects:

(a) Inversion of the T-wave, due probably to some effect on conduction through either the finer ramifications of the system of Purkinje fibers, or the musculature itself, or both. This effect is constant in occurrence and accompanies both the desirable and undesirable effects of digitalis, increasing in degree with increase in the amount of the drug given and persisting for several days, often as much as two weeks, and occasionally nearly three weeks, after withdrawal of the drug. This effect is the first to appear and the last to disappear.

(b) Delay in conduction through the bundle of His. The desirability of this effect varies with the conditions in the heart. In auricular fibril-

⁶³ Archives of Internal Medicine, June, 1918.

lation it is probably largely responsible for the brilliant results so often secured in decompensation with rapid, irregular heart action. In this condition digitalis should be given boldly and with confidence, and the Eggleston method gives most satisfactory results.

In individuals without auricular fibrillation but with a presumably normal conducting tissue, digitalis may be given by the Eggleston method apparently without harm, but no such striking improvement is

seen in cases with auricular fibrillation.

Price⁶⁴ advocates the following plan. He begins with 1 dram of the tincture per diem, or in urgent cases even $1\frac{1}{2}$ to 2 drams per diem, and continues until there is nausea and vomiting, diarrhea, headache, and unduly slow pulse-rate, or what is called "coupling of the beats." The drug should then be stopped until these symptoms have passed away, which is generally in a few days. In the great majority of cases the patient relapses, and the indication then is to find out what dose suits him best—that is, sufficient to control the action of the heart, without at the same time giving rise to any toxic symptoms; this may require weeks or even months of careful observation. Price generally begins with half the original dose, and this can be increased or diminished according as the rate of the heart increases or diminishes. In this connection help may frequently be obtained from the patient himself who is often able to say what dose suits him best; in other words, the patient's own sensations are often a good guide, and should be taken into account, as well as the pulse-rate.

The dosage necessary in individual cases may exhibit a wide variation; it may be as small as 1 dram of the tincture a week, or as large as 45 minims or more per diem. Having found the tonic dose for the particular individual, it will be found necessary, in the majority of cases, to continue the drug for the remainder of the patient's life. Variation of the dose may be needed, however, from time to time. Price believes that the cumulative effect of digitalis is not nearly so important as has been taught; at the same time the pulse-rate should be watched. "Coupling of the beats" is a danger signal, and calls for stopping the drug for a few

days or diminishing the dose.

Hatcher⁶⁵ states that in all cases requiring digitalis therapy, digitalis itself in the form of the powder, the tincture, fluidextract, extract or infusion may be used orally with the sole exception of those relatively rare cases in which immediate relief is imperative, and which require intravenous or intranuscular administration. In such cases the typical digitalis action can be induced immediately by the intranuscular or intravenous injection of *strophanthin* or crystalline ouabain (so-called crystalline strophanthin, not true crystalline Kombé strophanthin, which is not commercially available).

Hatcher emphasized the fact that there is a difference between an immediate action and immediate effect. He states that it has long been taught, without a particle of real evidence, that the action of digitalis cannot be induced promptly. The whole range of digitalis action up to

⁶⁴ Practitioner, November, 1917.

⁸⁵ Journal of the American Medical Association, November 3, 1917.

the maximum, that is, cardiac stoppage, can be induced within five to fifteen seconds by the intravenous injection of digitalis tincture, deprived of its digitoxin. This simple experiment, he states, disposes forever of the mischievous claim that digitalis action is slow. The *effect* of therapeutic doses is *gradually* induced; the action is immediate. He illustrates this by stating that a bullet fired through the heart *acts* instantaneously; the effect is a fatal hemorrhage, the rapidity of which depends largely on the size of the wound.

With suitable doses, Hatcher believes that digitalis exerts its action in

much less time than was formerly believed to be possible.

Although much has been done to dispel the once currently held belief that digitalis raises the *blood-pressure*, there still remains the suspicion in the minds of some that the drug should be avoided in the presence of high pressures. In a series of cases studied by Eggleston⁶⁶ he noted the following effects: (1) Among the group with approximately normal systolic pressures, none showed a change in the systolic pressure amounting to 10 mm. of mercury; 5 cases showed a fall of 10 mm. of mercury, or over, in the diastolic, none a rise and 3 no significant change; 5 showed a rise of 10 mm. or over in pulse-pressure, none a fall and 3 no change. All of the cases responded to digitalis with an increase in the pulse-pressure, and 1 with no change, showed marked clinical improvement; while of the remaining 2 cases with no significant change in pulse-pressure, one patient was moderately, the other slightly, benefited by treatment.

2. Among the high-pressure group the systolic pressure rose 10 mm. or over in 2 cases, fell 10 mm., or over in 1, and showed no change in 3; 3 cases showed a fall of 10 mm., or more, in diastolic, and 3 no change; 4 showed a rise of 10 mm., or over, in pulse-pressure, and 1 each, a fall and no significant change. Three of the 4 cases showing increased pulse-pressure also showed marked clinical improvement; in the fourth this was slight. The 1 case with no change in pulse-pressure showed moderate improvement, and the only case in either series in which the pulse-pressure fell by 10 mm. or more showed no improvements. The last patient

grew progressively worse and died about one week later.

In all of the first group of cases the increase in pulse-pressure was chiefly due to a fall in the diastolic, though rises of from 3 to 9 mm, occurred in the systolic in 4 of the 5 cases. Fall in diastolic pressure also chiefly accounted for the increased pulse pressure in 3 of the 4 cases in the second group, the other having been due wholly to a rise in the

systolic.

Taking all of the cases together, Eggleston believes that the administration of large doses of digitalis or digitaxin has very little tendency to elevate the systolic pressure, this having been increased by 11 mm. of mercury in one and 15 mm. in a second case. In only 1 case was the systolic pressure materially reduced, namely, by 23 mm. of mercury. On the other hand, the diastolic pressure was significantly lowered in 7, or 50 per cent., of the cases, while it was never significantly raised. He believes, therefore, that digitalis and digitoxin have very little influence

⁶⁶ Journal of the American Medical Association, September 22, 1917.

on the systolic pressure in either direction, that they tend to produce a significant reduction in the diastolic, and more decidedly to produce a material increase in the pulse-pressure. The following question is raised by Eggleston. To what, then, are the changes in the systolic, diastolic and pulse-pressures in man due? He believes that it is not possible, in the present state of our knowledge, to answer this question categorically, but the following suggestion may be offered. It has been proved that all of the digitalis bodies are capable of increasing the systolic output of the heart, and Stewart and Scott have been able to demonstrate that digitalis increases the blood flow through the arm in man. Eggleston believes that it may be suggested, therefore, that:

1. Digitalis, by improving the circulation, leads to improved pulmonary ventilation with the relief of cyanosis and the abolition of the vaso-

constrictor effect of carbon dioxide on the center.

2. The improved circulation results in the more normal functioning of the various organs and tissues of the body, and tends to restore to normal the several mechanisms by which the circulation is maintained

at its most efficient level.

On this hypothesis we should expect to find that the net changes in the systolic, diastolic and pulse-pressures would differ in different cases in order best to meet the conditions prevailing. This is precisely what is shown to occur in all of his observations, and explains the apparent divergence in the results of different observers. The observation that the pulse-pressure is increased in the majority of cases in which there is material clinical improvement as a result of the use of digitalis is also in harmony with this hypothesis, since the pulse-pressure is, to a certain extent, a measure of the efficiency of the circulation through the periphery.

Hatcher⁶⁷ also ridicules the idea that digitalis is dangerous in the presence of high pressure. This fallacy, he states, is one that dies hard and constitutes the greatest stumbling block in the way of the use of digitalis, next to that of regulation of dosage. Every one of the digitalis bodies acts on the vessels when enormous doses are passed directly into them, but this action is never induced by therapeutic doses. The contrary belief rests on the observation of the effects of massive doses in animal experimentation, and is not supported by any careful clinical observations or experiments with therapeutic doses.

In an experimental research on the effect of digitalin on the bloodpressure of animals, Hernando⁶⁵ found that the drug had little, if any, influence on the blood-pressure. His experience in human beings practically confirmed these findings: as a rule, the increase is insignificant

and there even may be a drop in the pressure.

While it seems clear that all the evidence points to the fact that digitalis, as ordinarily used, has no effect on raising the pressure, there is one condition in which its use is possibly attended with danger, namely, aneurysm of the arch of the aorta. Some years ago, Hare directed attention to this point, emphasizing the fact that while digitalis probably had no effect in raising the pressure, it might increase the liability

68 Medicina Ibera, January 24, 1918.

⁶⁷ Journal of the American Medical Association, November 3, 1917.

to rupture of the aneurysmal sac by reason of the increased force with which the blood was thrown into the aorta. If, therefore, the first portion of that vessel is diseased or already distended, it is conceivable that increasing the systolic force of the heart might bring about a pathological distention of a diseased aorta and increase or rupture a distention

if already present.

TREATMENT OF DELIRUM TREMENS. Following is the routine treatment for delirium tremens employed by Hoppe⁶⁹ in the Cincinnati General Hospital. Catharsis is used as a routine measure, calomel, followed by a rather large dose of epsom salts. Tincture of digitalis and tincture nux vomica, 10 drops of each, are given by mouth every three hours. In the active state of delirium, strychinine and digitalin are given hypodermically. Hoppe says that this stimulation is the most essential part of the treatment.

Emetine. For the past few years the number of articles dealing with emetine has been large. The past year is no exception. Although the use of this drug has been recommended in a variety of conditions, most of the articles have to do with its employment in the treatment of amebic dysentery (entameba histolytica). The principal difficulty at present is the toxicity of the drug. Waddell, Banks, Watson and King⁷⁰ have published tables showing the curative properties which the drug certainly possesses but conclude that until its preparation has been improved, and its intensely irritating properties abated or removed, a just estimation of its value in chronic dysentery cannot be made.

In reporting on the use of emetine in 59 cases of entameba histo-

lytica, Salvage⁷¹ summarizes his conclusions as follows:

1. Emetine hydrochloride injections were given to 19 cases of E. hystolytica infection—16 cyst carriers and 3 acute cases. Fifty per

cent. of the former were cured, and 33 per cent. of the latter.

2. Emetine injections in conjunction with (a) powdered ipecac, and (b) half-grain emetine orally, were given to 7 and 4 patients respectively, with very good results. Six of the former were cured, and all the latter.

3. Emetine-bismuth iodide was given to 33 cases—17 cyst carriers, and 16 acute cases; 82.4 per cent. of the cyst carriers were cured, and 50 per cent. of the acute cases. The results in the cyst carrier cases

corroborate those obtained in England.

4. Emetine, 1-grain injections, along with emetine-bismuth iodide, 1 to 2 grains daily, were given to (a) 2 cyst carriers, uncured by emetine-bismuth iodide—one was cured, the other relapsed; (b) 6 acute cases uncured by the double iodide alone—only 1 was cured, and the other 5 relapsed; and (c) 2 acute cases not previously given emetine-bismuth iodide—one was cured, the other relapsed.

5. Patients who have not previously had emetine injections appear to be cured with the double iodide, whether they are cyst carriers or

acute; 88.9 per cent. of such cases were cured.

⁶⁹ Journal of Nervous Disease, February, 1918.

Lancet, July 21, 1917.
 Journal of Royal Army Medical Corps, September, 1917.

6. Emetine-bismuth iodide causes the infection to disappear more quickly from the stools than does emetine hydrochloride, and appears to prolong the negative period before a relapse, and, consequently, a longer period of control seems necessary.

7. Acute cases were negative on the average for twenty-one days

before relapsing after treatment with emetine-bismuth iodide.

8. Emetine-bismuth iodide has practically no effect on intestinal

protozoal infections other than E. histolytica.

In commenting on the effect of emetine in the treatment of "carriers," MacAdam⁷² confirms the opinion of others that hypodermic courses of emetine are not sufficient to rid these cases of their infection. In the cases analyzed by him, it is to be admitted that in many instances emetine appears to have been administered in a somewhat casual fashion, frequently in a 4- to 6-grain course at a time, and very few of the cases appear to have had a continuous course of 12 grains given 1 grain daily for twelve consecutive days. Still a certain number of the men had a 10- to 12-grain course of emetine hypodermically, 20 grains in some instances, without definitely curing the infection, although immediately

alleviating the dysenteric symptoms.

In addition to its use for intestinal infection with the entameba, good results have been reported from the use of the drug in cases in which the infection has become localized in the liver. Brocq and Augé⁷³ have reported 3 cases of amebic suppuration in the liver cured with emetine alone. One of the cases reported had acute hepatitis, the general condition being so grave that no operation could be attempted. The use of emetine was followed by improvement within three days. Two doses of 0.02 gm. of emetine hydrochloride were injected daily for three days, then 0.04 gm. the fourth and fifth days, then 0.02 gm. gradually reducing the dose. The total given was 0.44 gm. in twelve days. In this case the infection was of eight years' duration. In the second case an exploratory operation revealed a large abscess of the liver in which no attempt was made to evacuate it. Emetine was given to the amount of 0.23 gm. in the first twelve days and the same amount in a second series of injections after a week's suspension. The third case illustrated the fact that the treatment must be prolonged enough or repeated sufficiently often to insure against a return of the symptoms.

In an experimental study with emetine, Dale and Dobell⁷⁴ reached

the following conclusions:

1. Two strains of entameba histolytica were established in kittens: One from vegetative ameba injected per anus, was transmitted through 43 passages; the other, from cysts injected into the stomach, through six passages. In neither case did the strains alter perceptibly in character with successive passages.

2. Various alkaloids and other substances, including the natural alkaloids of ipecacuanha and artificial derivatives therefrom, were tested on the amebæ *in vitro*. Emetine and the other alkaloids of ipecac-

⁷² Lancet, January 5, 1918.

⁷³ Revue de Chirurgie, January and February, 1917.

⁷⁴ Journal of Pharmacology and Experimental Therapeutics, December, 1917.

uanha exhibited no characteristically high toxicity for the amebæ, as compared with that of some other alkaloids. Certain samples of entameba histolytica from the kittens survived the action of 1 in 1000 and even 1 in 100 emetine, for periods up to one hour. Amebæ which survived treatment by 1 in 1000 emetine were found to be still capable of infecting kittens.

3. Experimental dysentery in kittens was refractory to all kinds of treatment. Neither the ipecacuanha alkaloids, nor other substances having a powerful action on the amebæ in vitro, could cure the infec-

tion or definitely modify its course.

4. Methyl-psychotrine, a natural alkaloid from ipecacuanha which is more toxic for entameba histolytica, when tested in vitro, and much less toxic for mammals than emetine, has been tested clinically on cases of amebic infection in man. It appeared to be entirely devoid of thera-

peutic action, though given in relatively very large doses.

On the basis of these results, it seems clear to them that there is some other factor in the cure of dysentery by emetine than the alkaloid and the ameba; and that factor must be supplied by the host. The participation of the host in the process is believed to be further evidenced by their observation that emetine has no appreciable effect on the course of amebic dysentery in the cat, while it cures the disease in man, even when the same strain of ameba is present in the two hosts. It should be remembered that the entameba histolytica is an obligate parasite which, unlike some other amebas that surive in the contents of the bowel, can live and multiply only by invading the tissues of the host. Perhaps, therefore, the effective drugs act by promoting some natural defensive reaction to invasion. In any event the theory of the mode of action of emetine in amebic dysentery needs reconsideration; and on its correct formulation rest in no small measure the possibility of selecting other suitable amebacides. 75

In order to overcome certain difficulties of the emetine treatment, the use of emetine-bismuth iodide was introduced several years ago. In the report of 104 cases treated by Lillie and Shepheard the patients were kept in a special ward set apart for the purpose and the treatment was kept as uniform as possible. The keratin-coated tablets and salolcoated pills were given in doses of 3 grains per day for twelve consecutive days without any additional treatment. The tablets and pills were given entire as a full dose during breakfast. A patient was considered to be cured when at least six or seven negative tests were obtained over a period of not less than seven weeks from the termination of the course Lillie and Shepheard believe the following conclusions of treatment.

are justified:

1. (a) That "carriers" of E. histolytica who had not had any injections of emetine hydrochloride were cured to the extent of 78 per cent. by two courses of salol-coated emetine-bismuth iodide pills. the case of men who had had emetine injections, 72.8 per cent. were cured by two courses of the salol-coated pills. (c) In the case of men

Editorial, Journal of the American Medical Association, May 25, 1918. ⁷⁶ Lancet, September 15, 1917.

who had not had emetine injections, 70 per cent. were cured by two courses of the keratin-coated tablets. (d) In the case of men who had had emetine injections, 45.4 per cent. were cured by two courses of the keratin-coated tablets.

The difference between the percentages in (a) and (b) are within the range of experimental error and need not be considered. But in (c) and (d) the difference is too great to be ignored. This difference may be due to variation in the quality of the keratin-coated tablets, but such a defect would be common to both cases which had received injections of emetine and those which had not. It is generally admitted that certain "carriers" of E. histolytica are not cured by emetine in any form, and it may be, as Dobell suggests, that these cases become segregated in (d). It seems possible that the difference in the two percentages may be due to the injections of emetine rendering the "carriers" less liable to be cured by emetine-bismuth iodide.

2. There is no evidence that the length of time between the dates of onset of dysentery symptoms and the treatment has any effect upon

the chances of cure by emetine-bismuth iodide.

3. There is no ground for the belief that the vomiting diminishes the chance of cure by this treatment. There is nearly as much vomiting among the cases which are cured as among those which relapse.

4. The age of the patient has no effect upon the chance of cure of the drug. But there is evidence to show that men over forty years of

age vomit less while undergoing treatment.

5. The salol-coated pills are a distinct improvement upon the keratincoated tablets from a curative point of view. They also cause less

vomiting and loss of weight.

Lambert⁷⁷ believes that the emetine-bismuth iodide combination is of considerable potency in the treatment of amebic dysentery, particularly when the amebæ are becoming resistant. Given in full form, and in doses not exceeding 2 grains, the emetic effects appear to be slight. It can also be used to advantage in conjunction with emetine hydrochloride hypodermically in acute amebic dysentery. In these cases convalescence seems to be established earlier and the patients are less likely to become carriers. Lambert does not believe that the combination can be looked upon as a substitute for emetine hydrochloride in the acute cases, but, in carriers and in convalescents harboring cysts, emetine-bismuth iodide should prove superior to emetine. As a public health measure, he advocates the use of this combination in all cases of amebic dysentery during convalescence.

Leboeuf⁷⁸ also reports favorable results from the use of emetine-bis-

muth iodide.

In addition to its use as a specific in cases of amebiasis, emetine has been recommended in a number of other conditions having no relation whatever to this infection. As a rule its use is only tentative in such cases and in hardly a single instance has it proved of value. Lewisohn⁷⁹

⁷⁸ Presse Médicale, July 9, 1917.

⁷⁷ British Medical Journal, January 26, 1918.

⁷⁹ Journal of the American Medical Association, January 5, 1918.

reports on the action of emetine in the treatment of malignant tumors. He concludes that:

1. Injection of emetine into carcinoma and sarcoma may cause a complete macroscopic disappearance of most of the tumors. This disappearance is not due to a specific action of emetine on the tumor cells. The action of the drug is purely caustic, similar, though in less degree, to the action of phenol (carbolic acid), zinc chloride, etc.

2. Repeated intravenous injections of emetine do not affect the growth of carcinomas and sarcomas. This proves conclusively that emetine has no specific effect on the growth of malignant tumors.

3. These observations do not strengthen the amebic theory of malignant tumors.

Van Hoosen⁸⁰ has also employed emetine in the treatment of carcinoma. The drug was injected directly into the growth (inoperable). The use of small doses $-\frac{1}{2}$ grain and 1 grain—has been discontinued and at present she gives 4 to 8 grains daily in 2-grain doses. She claims that 8 grains in 2-grain doses every two hours for four hours does not produce any uncomfortable or dangerous symptoms in carcinomatous patients. The hardening noticed in the tissues seems to be due to a fibrosis set up by the selective action of the emetine on the carcinomatous tissue. Inasmuch as all who have employed this drug in the treatment of dysentery warn against its toxic effects, the large doses advised by Van Hoosen do not seem to be free from danger.

Diamantis⁸¹ reports striking results from the use of emetine in the treatment of bilharzia hematuria. He administered the emetine intravenously. He gave the drug at two- or three-day intervals, commencing with 0.02 c.c. and increasing rapidly to 0.10 which dose he never exceeded. From fifteen to twenty injections were generally sufficient. He found that vomiting and nausea are rare, but dizziness is constant,

and there is always more or less pronounced asthenia.

One of the drawbacks to the use of emetine is its toxic effects, especially when given repeatedly in small doses. This is not sufficiently appreciated by physicians who are administering the drug in a variety of conditions and with the belief that the drug is free from danger. Attention has been called, in previous issues of Progressive Medicine, to the fact that emetine itself is frequently a cause of diarrhea. It is important to bear this in mind when employing the drug in the treatment of amebic dysentery as the diarrhea may be looked upon as due to the amebic infection. Under such circumstances the emetine should be withdrawn instead of being pushed.

Whitmore⁵² also emphasizes the toxicity of the drug and its tendency to produce diarrhea. In treating a case with emetine a diarrhea may develop and the emetine is pushed as it is thought the dysentery has returned. Instead of that, the man is poisoned from the emetine and will die if the use of the emetine is persisted in. Whitmore states that what is preferred now is to give a man not over 10 grains of emetine

⁸⁰ Women's Medical Journal, January, 1918.

Journal d'Urologie, August, 1917.
 Pennsylvania Medical Journal, February, 1918.

in one course and then stop it. Ordinarily, the dysentery will have stopped; but even if the dysentery has not stopped it is necessary to stop the emetine. Ipecae can be given in some other form, and the man is given a rest from the emetine for a month. Then another course of emetine may be given. If a patient receives 25 or 30 grains of emetine in one course, Whitmore believes there is a serious danger of producing serious symptoms of poisoning or even death. In addition to diarrhea Whitmore states that emetine poisoning may manifest itself by edema of the face and limbs; weakness in the muscles in the back of the neck—the patient cannot hold his head up, but lets it drop forward; pain in the back of the neck; weakness and pain in the muscles of the legs; feeble heart sounds and dyspnea.

De la Paza and Montenegro, ⁸³ as the result of the experimental use of emetine hydrochloride in dogs, found that the drug gives rise to congestion and slight parenchymatous degeneration of the kidneys.

John M. Robinson⁸⁴ has reported some interesting observations on the toxic action of emetine on the eye. In ordering a 2 per cent, solution of homatropine hydrobromide the druggist by mistake furnished a solution of emetine. The action of the emetine on the eye was that of a severe irritant. It produced an irritating sensation not unlike a foreign body and an intense "scratchy" feeling, the latter occurring at intervals of five or ten minutes. At the times the "scratchy" feeling occurs there is spurting of tears, between the spasmodically closed lids, or down the nostrils,—virtually, an ocular tenesmus.

Ethylhydrocuprein (Optochin). In a second study of the effect of ethylhydrocuprein (optochin) in the treatment of pneumonia, Moore and Chesney state that a further experience with 75 cases failed to show any favorable influence. Their reasons for believing the drug to be useless in the treatment of pneumonia are as follows: It is impossible to administer a sufficient amount of the drug to produce an effective concentration in the blood stream without, at the same time, exposing the patient to the danger of toxic action. The rate of the pneumococcidal action of ethylhydrocuprein is too slow in the concentrations which may be attained in the blood stream of the patient with any degree of safety; pneumococci, therefore, may gain access to the circulating blood at a greater rate than they are destroyed therein, even though the serum show pneumococcidal action. In the concentrations which are safely attained in the body fluids, the drug probably penetrates but poorly into the alveolar exudate.

The routine use of ethylhydrocuprein in the treatment of acute lobar pneumonia cannot be recommended. An additional reason should be emphasized, namely, the danger of amblyopia. Among the 75 patients treated by Moore and Chesney, there were 9 who showed some degree of amblyopia. This was mild in 3, and moderately severe in 6. In those who recovered from the pneumonia, the eye symptoms disappeared completely after the withdrawal of the drug.

⁸³ Philippine Journal of Science, January, 1918.
⁸⁴ American Journal of Ophthalmology, April, 1918.
⁸⁵ Archives of Internal Medicine, May, 1918.

Wallgren⁸⁶ has used optochin in 9 cases of pneumonia with disappointing results. Three of his patients died. In a study of the literature he found that among a total of 268 cases in which the ethylhydrocuprein was given in the first three days there was a mortality of 8 per cent., and amblyopia in 7 per cent. In another series the drug was not given until after the third day. In this group the mortality was 19 per cent.

and amblyopia occurred in 4 per cent.

Barker and Roundtree⁸⁷ call attention to the fact that murtol (a preparation closely allied to eucalyptol) is used, at times, in the treatment of putrid bronchitis, and that symptoms of poisoning from the use of these preparations have occurred. Myrtol and eucalyptol are both derivatives of myrtaceous plants. Symptoms of poisoning have followed both overdoses and small doses of eucalyptol. It is possible that certain individuals are unduly sensitive to the drug. Two different syndromes have been noted: (1) Nervous system involvement with collapse; (2) dermatitis. In the nervous type the patient becomes seriously ill shortly after the drug is administered. Vomiting, diarrhea and coma may follow. Vomiting must be reduced to prevent further absorption of the drug. Skin lesions are often associated with the nervous lesions. In several instances death has occurred. Eucalyptol was for a time extensively employed in the preparation of dichloramin-T, but is no longer so used.

Heliotherapy. As the result of a limited experience with the use of heliotherapy in surgical tuberculosis, Freiberg88 concludes that exposure to the sun's rays resulted in speedy improvement, which can fairly be attributed to this agency. This seemed to be corroborated by the retrogression which ensued on having to abandon the systematic use of the sunlight. The patient should, therefore, continue the treatment during the winter in his own environment. Freiberg's experience, even in the vicinity of large cities at low altitudes, seems to indicate that the method is of value in spite of the contention of Rollier that the potency of the ultraviolet rays is greatly diminished by the stratum of moist and

unclean air through which they must pass.

As a result of his experience with heliotherapy in the treatment of various forms of tuberculosis, Mayer⁸⁹ concludes that we can safely assert that light therapy is a valuable adjuvant but must be used together with the usual routine treatment. In bone and joint tuberculosis, results have been most remarkable, with the closure of sinuses and both the healing of joint lesions and the reëstablishment of function. Almost equal success has been met with in tuberculous disease of the skin, mouth, glands, pleura and peritoneum Occasional disappearance of definite and marked disease of the ocular and genito-urinary apparatus has occurred. In laryngeal cases, some few favorable results were obtained, especially by the direct application of light to the focus. Finally

Transactions Association of American Physicians; Journal of American Medical Association, June 15, 1918, p. 1887.

88 American Journal of Orthopedic Surgery, September, 1917.

89 American Review of Tuberculosis, February, 1918.

Vpsala Läkareförenings Förhandlingar, 1917, xxii, No. 4; Journal of American Medical Association, August 3, 1918.

in pulmonary tuberculosis, in a very few selected instances, definite favorable results were obtained that had to be considered as due to this therapeutic aid and which no other means of treatment alone was able to offer.

The use of artificial heliotherapy in the treatment of lupus and surgical tuberculosis is reported by Reyn and Ernst. 90 They employed electric light baths in the form of the carbon are light. They state that their results were quite as good as those obtained by heliotherapy in favored climatic resorts. The aim with the general bath is to have the body absorb as much of the chemical rays as possible. The exposures are for one-quarter to half an hour at first, gradually lengthening them, in the course of a week or two, to two and a half hours. This was the extreme limit. In the case of lupus, the course lasted from four to eight months. Many of the cases were old and rebellious. In the tuberculous cases the best results were obtained with osteitis and arthritis; some did better with a current of 20 ampères, others with 75 ampères. Experience with the mercury vapor quartz lamp, the socalled "mountain sunlight" lamp, proved less effectual than the carbon are light. The skin tans under the arc-light as under sunlight.

Sokolow⁹¹ states that the therapeutic action of the sun's rays depends on violet rays, but that these vary greatly under natural conditions as the result of differences in altitude and atmospheric conditions. These disadvantages led to attempts to duplicate the action of the sun artificially. This resulted in the quartz lamp. The action of the rays from this lamp are first a hyperemia of the skin, then inflammation and desquamation, the results following the exposure by several hours and not being noticeable immediately. Sokolow's experience with the quartz lamp in 46 cases of different diseases gave varying results. In

no case did he obtain startling or brilliant success.

Amstad⁹² states that tuberculous joints may be treated by a combination of heliotherapy and the x-rays, especially if the process is sluggish.

In the use of heliotherapy in tuberculous children, Jeanneret and Messerli⁹³ call attention to the importance of pigmentation of the skin. The pigmentation seems to be a normal phenomenon of a defensive reaction. It depends on the proportion of hemoglobin in the blood, hence is an index of the general resistance of which the organism is capable, and its power of reacting to the heliotherapy. Premature subsidence of the tan is a sign that the hemoglobin supply is giving out. Tuberculous cases, as the result of autogenous intoxication, are especially apt to show diminution of the hemoglobin. This secondary anemia is revealed in the depigmentation of the tanned children.

In the treatment of wounds, Fréche⁹⁴ has not had encouraging results from the use of heliotherapy. This he ascribes to the fact that the moist surfaces inhibit the bactericidal action of the rays. The only wounds

Hospitalsted, May, 1917.
 Cor.-Blatt f. Schweizer Aerzte, May 26, 1917.

 ⁹² Ibid., March 11, 1917.
 ⁹³ Revue Médicale de la Suisse Romande, November, 1917. 94 Jour. de Médecine de Bordeaux, September, 1917.

that seemed to be benefited by heliotherapy were of the torpid type, with smooth, pale, pink tissues and no tendency to granulations. But, even in these cases, Fréche found that other physical or chemical stimu-

lants gave equally good results.

Hexamethylenamin. Several years ago this drug was considerably used in the treatment of acute respiratory infections. Neves⁹⁵ reports on its use in 92 children suffering with *bronchitis*. A favorable effect was noted in but 5 of 18 cases of acute bronchitis; in 8 of 46 with subacute bronchitis; and in but 2 of 28 with chronic bronchitis. His conclusions are that this drug cannot be depended on in the treatment of bronchitis in children. He believes, however, that the hematuria and other untoward effects sometimes noted by others from the use of the drug are to be ascribed to excessive dosage.

Loeper^{9†} has used hexamethylenamin intravenously in the treatment of certain of the acute infectious diseases, namely, typhoid fever, bronchopneumonia, and lobar pneumonia and also in diseases of the kidneys and liver. The solution used contains 0.25 grain of hexamethylenamin to the cubic centimeter of cold sterilized water. The effects of the drug when given intravenously are said to be greatly superior to its hypodermic or oral use. The action is threefold—antipyretic, sedative and diuretic. Loeper believes that the drug can be employed intravenously to advantage in the treatment of certain cases of pulmonary and visceral tuberculosis.

Ustveat⁹⁷ reports a case of toxic action on the kidneys from the use of hexamethylenamin. He prescribed five 1-grain doses during the night, four similar doses the next day, and three the following night. At noon of this day the urine was dark red with blood but there was no vomiting or headache. The urine showed the presence of blood and

albumin for five days.

The local application of strong hydrochloric acid Hydrochloric Acid. in the treatment of neuritis, and particularly sciatica, is favorably commented on by Sainsbury. 48 He ascribed the discovery of the treatment to Hugh Wingfield. In a later issue of the Lancet (July 14, 1917) it is pointed out that the treatment has been known for some twenty years. Thus, a thesis on the subject was published by Geunetas on the basis of 12 cases of sciatica successfully treated; Bayliss has reported 16 cases. In most of the latter's cases, the trouble had defied every other method of treatment. Two were promptly cured; 11 were considerably relieved; and 3 showed no improvement. Bayliss also treated 10 cases with intractable pain in the heels and plantar region, for the most part the sequelæ of gonorrheal arthritis. Four of these patients were cured; one was much relieved, and five were not improved. In sciatica, the treatment consists of painting strong hydrochloric acid over the course of the sciatic nerve.

Lancet, June 16, 1917.

²⁸ Archives de Médecine des Enfants, January, 1918.

Paris Letter, Journal of American Medical Association, August 10, 1918, p. 483.
 Norsk Magazin for Laegevidenskaben, June, 1918; Jour. Am. Med. Assn., August 24, 1918.

IODINE 349

Hyoscine. Douglas⁹⁹ states that hyoscine, given hypodermically, has many remarkable and valuable qualities as a hypnotic, but, if uncombined, is very uncertain in its action, and often produces most undesirable symptoms. At times it causes a refreshing sleep, and no other effect is noticeable. Again, in the same patient, it may produce loss of muscular coördination and of memory, accompanied by extreme restlessness, which requires the constant attention of a nurse. Unless restrained, the patient will insist on getting out of bed and falling about the room, with the possibility of seriously injuring himself. Why the drug acts in such opposite ways in different patients, and even at different times in the same patient, is a question Douglas leaves for others to explain. If the untoward effects of hyoscine could be prevented, it would be one of the most safe and satisfactory hypnotics.

Douglas overcomes the untoward effects of the hyoscine by combining apomorphine (grain 0.025 to 0.02) with it. He states that apomorphine, administered hypodermically in small doses, shuts off the stream of consciousness with valve-like precision. Its action, however, while prompt, is transient. This defect is overcome by hyoscine, the hypnotic effect of which usually lasts several hours. On the other hand, the muttering delirium which so often comes on during the first hour after the administration of hyoscine is prevented by the quick hypnotic action of the apomorphine. In many cases 0.005 grain of hyoscine is quite sufficient, and under no circumstances should 0.01 grain be given. The

average dose of the hyoscine may be placed at $\frac{1}{50}$ grain.

Douglas claims to be the first to demonstrate the hypnotic effects of apomorphine. Originally, he suggested $\frac{1}{3.6}$ grain hypodermically as the proper dose. More extended experience, however, has convinced him that a smaller dose is preferable. The amount of the dose is important; too much may cause vomiting; too little will produce no hypnotic effect. Usually the dose of the apomorphine lies between 0.025 to 0.02 grain. The hyoscine and the apomorphine should be mixed and administered hypodermically. If morphine is indicated, it combines well with the other two drugs.

When quick action is desired, accompanied by entire safety and a reasonable probability of a good night's sleep, Douglas has found this combination a most dependable one. In the treatment of the excited stage of *alcoholism*, and other states of mental excitement, it is especially valuable. It promptly overcomes the insomnia of these patients,

regardless of their wishes in the matter.

Iodine. The use of iodine as an antiseptic in surgical operations is now an established procedure. In obstetrical work, Stone¹⁰⁰ states that, after anesthesia has been induced, he employs the diluted tincture, U.S.P., 1 part to 3, of 95 per cent. alcohol. This is perfectly satisfactory in skin sterilization of any part of the body and any mucous surface. After an experience of many years, he has found no reason for returning to the use of stronger dilutions; in no instance has irritation of the skin occurred, nor is he aware of any wound infection wherein a stronger

New York Medical Journal, December 1, 1917.
 Journal of the American Medical Association, May 18, 1918, p. 1489.

application would have served a better purpose. Stone urges against the use of mercuric chloride solution just before applying the iodine, as severe dermatitis may result, owing to the formation of red mercuric iodide. He refers to an instance of this occurring several years ago.

In the treatment of tuberculosis, iodine has, for a long time, occupied a more or less prominent place. It is one of the drugs employed in the management of tuberculous patients which is used extensively for a time, allowed to lapse and again resorted to. A few years ago the use of the tincture of iodine was brought forward. I have employed it considerably myself, especially in those cases in which the amount of sputum was large. In many cases the results are very good; in others, no

especially beneficial effect was noted.

Boudreau¹⁰¹ believes that iodine has an actual curative action in many cases of pulmonary tuberculosis, but it has to be given properly. Tolerance must be established by fractional doses. He begins with one drop of the tincture repeated six or seven times during the day, adding this drop to the usual beverage at the meals. The next day two drops are given at each dose, the third day three drops, and so on, gradually increasing to thirty, sixty, ninety drops or more, according to the way the stomach bears it and the individual need for it. He has had patients who finally reach doses of several hundred drops, and keep this up for months or even years. He has never noted any untoward effects. In several cases I have noted a rash, such as sometimes follows the use of the iodides. In the main, however, it may be said that the drug is taken, even in large doses and for a long time, without inconvenience.

In commenting on the action of iodine in tuberculosis, Curtin¹⁰² draws the following conclusions: (1) The ferment-inhibiting action of the tubercle bacillus is due to the presence of unsaturated fatty acids. (2) These fatty acid compounds can be removed by means of ether. (3) Iodine and iodide of potassium remove or modify the inhibiting action of the tubercle bacilli. These conclusions are based on the work of Joblins and Peterson who found that soap of the unsaturated fatty acids was capable of inhibiting the action of trypsin and other

ferments.

Curtin has for several years treated phthisis by means of intravenous

injections of *iodoform* dissolved in ether.

Blackford and Willius¹⁰³ report on the use of alpha iodine, the active constituent of the thyroid which Kendall has isolated, in cases of heartblock. One half of a millegram of alpha iodine was administered daily. The drug quickens the idioventricular rate in complete heart-block. This is followed by marked subjective relief to the patient. The dose is then reduced to the largest amount that can be taken without discomfort.

In the treatment of goitre of the atoxic type, Kjolstad¹⁰⁴ reports good

¹⁸¹ Jour, de Médecine de Bordeaux, June, 1917.

Medical Press, November 14, 1917.
 American Journal of the Medical Sciences, October, 1917. 113 Norsk Magazin for Lægevidenskaben, May, 1918; Jour. Am. Med. Assn., April 27, 1918.

results from the use of iodine. He states that the patients must be warned that the iodine treatment takes a long time; too vigorous treatment he regards as dangerous. In the treatment of colloidal goitres, he gives 0.10 gm. of potassium iodide every other day for two weeks, then suspends treatment for three weeks, resumes the iodide for two weeks, and so on. With parenchymatous goitres, he follows the Kocher method of anointing the goitre with an iodine-potassium iodide salve, using from 1 to 3 gm. daily, for two weeks at a time, then suspending treatment for three-week periods. The salve is better than the tincture as it is less irritating to the skin.

Iron. Rowe¹⁰⁵ has contributed an experimental study on the hypodermic use of iron. He points out that the use of iron internally as a tonic in cases of *anemia* has been for years, and still is, a common practice. This treatment is entirely safe, but is also somewhat unreliable, due to the incomplete absorption and assimilation of the iron. The difficulty has been only partially obviated by the internal use of complex organic preparations of iron, several of which have been placed on the market.

In recent years the hypodermic administration of iron has become increasingly popular. For this purpose the iron is usually presented in the ferric form, as iron and ammonium citrate, since this is one of the

least irritating and most soluble of the salts of iron.

Rowe states that in severe cases of anemia in which iron is used as a therapeutic measure, it should not be surprising if, sometimes, a rather marked systemic reaction is observed. The dose generally used in such cases is too large to be absorbed properly and the iron entirely changed into hemoglobin. The experiments carried out by Rowe, upon healthy dogs, represent a much more vigorous therapeutic treatment than that from which some human patients have been reported to have suffered severe reactions. He states that there is no mention made in any of the standard works on pharmacology that dogs are unusually resistant to the toxic action of iron, so that the difference between the results on animals and those reported by physicians must be accounted for in some other way. In his opinion, the most logical explanation of this difference seems to be that the anemic patient, due to his lowered vitality, is unable to assimilate large doses of soluble iron salts, and systemic disturbances result.

The local irritation produced by the hypodermic use of iron solution is frequently encountered. In experiments upon healthy animals the local irritation produced has not been found, in Rowe's experience, to be sufficient to merit serious consideration. However, as in the case of other heavy metals, iron apparently causes considerable local irritation when injected hypodermically into anemic patients. This difficulty, he believes, will probably never be entirely overcome until a satisfactory

colloidal solution is obtained.

Lactic Acid Bacilli. The treatment of leucorrhea by means of lactic acid bacilli is reported by Block and Llewellyn. 106 After experimenting

Therapeutic Gazette, December, 1917.
 Journal of the American Medical Association, December 15, 1917.

with a number of preparations, they found that the best results were to be obtained from the use of bouillon cultures, provided the culture was reasonably fresh. Practically, however, the use of fresh cultures was not feasible on account of not being able to keep fresh cultures always on hand. Organisms compressed in tablet form, with lactose, were found to be reasonably active, and, provided they were kept on ice,

answered the purpose.

Their technic was as follows: The patient is placed in the usual position for a gynecological examination. A bivalve speculum is then inserted into the vagina and the cervix and upper vaginal canal exposed. The reaction of the vaginal secretions is then taken by means of a piece of litmus paper. The normal reaction in the healthy adult virgin is acid. In a patient suffering from chronic leucorrhea, with the exception of one type, the reaction is distinctly alkaline. After determining the reaction, the vagina is thoroughly cleansed by means of a simple alkaline spray and then dried with cotton pledgets. A lactic acid tablet, preferably one that is readily soluble and made with a lactose base, is placed in a medicine glass and moistened with one or two drops of sterile water dropped on the tablet by means of a small pipet or eye dropper. It is important not to supply more than a very few drops of water to the tablet; otherwise the tablet will completely disintegrate and cannot be readily handled. If the proper kind of tablet is used, and only enough water is applied to moisten it, it will attain the consistency of thick cottage cheese, and may be readily lifted by a pair of forceps. It is then placed in the upper vaginal canal, and spread over the walls and in the cervix by means of the forceps. If the tablet is of the proper consistency it will adhere to the vaginal mucosa wherever placed. The speculum is next withdrawn half way, with the blades open, in order to allow the upper vaginal canal to close over the application. Finally, the blades are closed and the instrument is withdrawn. No tampons are used. The patient is instructed to return in a week, and all douching is prohibited. On her return, the same technic is repeated. The treatments are continued until the vaginal secretions become acid. In favorable cases this is accomplished in three or four weeks. After the reaction becomes acid, no treatment is given so long as it remains so. In favorable cases, it is usually found necessary to reimplant the organisms at intervals of three or four weeks, since, after that time, they seem to lose their potency. The treatment, therefore, is seldom a permanent cure, but rather a good palliative measure, requiring repetition about once a month. It supersedes douches.

In the treatment of *culvovaginitis* in children, the method is of little use as long as gonococci are present. When, however, the gonococci have disappeared, the use of lactic acid bacilli seems to be of some value. In the non-specific types of vaginitis in children, the results were more encouraging, and in a good percentage of cases they believed they brought about a cure. In order to overcome the difficulty of introducing the moistened tablet into the vagina of children, they adopted the plan of inserting the tablet dry and then injecting into the

vagina a little water.

Among women of childbearing age, nothing is to be hoped for from this method of treatment in cases in which there is present a gross pathological condition in cases of gonorrheal endocervicitis; or when evident pathological erosion, laceration, or other unmistakable lesions are the cause of the leucorrhea. After excluding these cases, there is a very considerable number in which a leucorrheal discharge is the only symptom, and in which no definite disease can be detected. Cases of this type yielded good results in about 50 per cent.

Many women past the period of the menopause suffer from a senile, or atrophic, vaginitis which is characteriszed by a thin, yellow, malodorous, irritating discharge, and accompanied by intense itching of the genitalia, and sometimes by urinary frequency and burning. In this type of case, Block and Llewellyn state that they obtained their best results in spite of the fact that the vaginal secretions are acid in reaction. While they did not obtain a permanent cure in any of these cases, they did succeed in giving great relief to the patients. In some instances several months would elapse before it was necessary to repeat the implantation. They state that not less than 80 per cent. of this type of case was distinctly benefited.

In the treatment of *colicky babies* and infants, as well as older children, with severe chronic digestive disturbances, whose stools show distinct gas production upon culture, are in Bozart's¹⁰⁷ experience almost invariably benefited by cultures of lactic acid bacilli, in frequent and full dosage. Undoubtedly, in the milder infections, diet alone, lowering of the sugar and fat percentage of the food, will suffice. The improvement, however, is frequently far slower. On the other hand, cases showing similar symptoms but no gas have not, as a rule, responded.

Mercury. During the past three or four years the literature has contained numerous references to poisoning by means of mercury, usually in the form of mercuric chloride from the use of the familiar bichloride tablets. In many instances the poisoning has been brought about with suicidal intent; in others, bichloride tablets have been taken by mistake. Because of the frequency with which mercury is taken by mistake and because of the ease with which it may be obtained it has been urged repeatedly that bichloride of mercury tablets should be sold only on a physician's prescription.

An increasing number of accidental poisoning cases is occurring through the use of bichloride of mercury vaginal douches or the insertion of a bichloride tablet into the vagina. During the past year, Campbell¹⁰⁸ has observed 2 cases, 1 of which resulted fatally, in which poisoning occurred through the vagina. In 1 case a woman inserted a mercuric chloride tablet into the vagina to prevent conception. In the second case the woman was advised by a lay person to take vaginal douches containing mercuric chloride. She dissolved two tablets (17.5 grains) of mercuric chloride in a pint of water and used this solution as a douche. The fluid was retained until it burned. A third instance is reported by Millar.¹⁰⁹ In this case a woman who had been in the habit of taking

New York State Journal of Medicine, January, 1918.
 Archives of Internal Medicine, December, 1917.

¹⁰⁹ British Medical Journal, 1917.

mercuric chloride douches inserted a tablet into the vagina at bedtime. The woman seemed to think that this was practically the same as taking

a douche. Death occurred six days later.

In addition to the marked local disturbance which the mercury produces in these cases, the constitutional disturbances are identical with those in which the mercury is taken by mouth. One of the reasons that women have resorted to this use of mercuric chloride is because of the widespread belief that the vagina is generally regarded as an organ

incapable of absorbing pharmacological agents.

In a recent elaborate study, Macht¹¹⁰ has shown that the absorptive power of the mucous membrane of this organ is very active. His studies have shown that all kinds of pharmacological agents -alkaloids, inorganic salts, esters, and antiseptics—can be absorbed with comparative ease. For this reason such drugs as opium or belladonna may be rationally administered by the vaginal route when suitable circumstances arise. Probably the greatest lesson to be learned from this study is the danger that is present in the employment of douches, tampons, suppositories, uterine wafers, etc., for their local effect. It must be borne in mind that a generalized reaction may also take place.

Poisoning by mercury, no matter how introduced, gives rise to a severe enteritis and serious damage to the kidneys. MacNider¹¹¹ found, when acute mercuric chloride poisoning was induced in dogs, that death was due either to the shock associated with the severe mercuric enteritis or to a delayed kidney injury. The injury to the kidney was constantly associated with the development of an acid intoxication. He states that the delayed kidney injury is not due to the action of mercury, as such, during its elimination by this organ. The source of the acid

intoxication is under investigation.

Milian and de Saint-Avid¹¹² report a case of acute poisoning in a young man which manifested itself mainly by gastro-intestinal uremia, vomiting, diarrhea, Cheyne-Stokes dyspnea, and a sensation of oppression in the chest. Anuria was complete for two days, and almost complete for the three following days. During the polyuria reaction period, symptoms suggestive of peritonitis arose. This Milian ascribes to the extreme dehydration brought about by the vomiting and later the polyuria, a condition similar to that which occurs in cholera. To overcome this, intravenous injections of a hypertonic glucose solution (60 gm, of glucose to 200 c.c. of distilled water) were given. The result was extraordinarily

An interesting observation is reported by Goodwin. 113 This is an investigation of the kidney function three years after recovery from acute mercuric chloride poisoning. The patient was readmitted to the hospital three years later. She looked well, and stated that she had been well except for an occasional headache and pain in the back. The results of two urine examinations which had been done two months prior to her

Journal of Pharmacology and Experimental Therapeutics, 1918, x, 509.
 Journal of Experimental Medicine, April, 1918.

¹¹² Paris Médicale, September 1, 1917.

¹¹³ Journal of the American Medical Association, January 12, 1918.

admission showed a specific gravity of 1028 and 1026 respectively, and no albumin or easts. A specimen examined in the hospital showed a faint trace of albumin, normal phenolsulphonephthalein and urea excretion and some delay in salt excretion.

An instance of *idiosyncrasy to mercury* is reported by Gjessing. His case was that of a woman who exhibited a violent reaction to the injection into the nose of 1 c.c. of a 1 per 10,000 solution of mercuric

chloride containing a little epinephrin.

The treatment of cases of acute mercuric chloride poisoning has been described in full in previous issues of Progressive Medicine. The Lambert-Patterson method, at times slightly modified, is now the established procedure. Briefly, this method is as follows: (1) Continuous rectal irrigation by the drop method with 1 dram of potassium acetate to the pint of water; (2) washing of the stomach twice daily; (3) irrigation of the colon twice daily; (4) a daily sweat in a hot pack; (5) the administration every other hour of the following mixture: potassium bitartrate, 1 dram; sugar, 1 dram; lactose, ½ ounce; lemon juice, 1 ounce; boiled water, 16 ounces; on the alternate hours, administration of 8 ounces of milk.

In an experimental study of mercuric chloride poisoning, Sansum¹¹⁵ was unable to show that the promotion of free diuresis contributes materially to the chances of recovery, and that attention to this phase of the treatment may obscure that which is more essential. Elimination through the bowel is, in his opinion, the essential thing to accomplish. Practical therapeutic efforts should be directed toward the accomplishment of two things: (1) Mechanical removal of the poison from the lumen of the alimentary tract. (2) Antidoting the poison before it leaves the

portal circuit, that is, particularly before absorption.

I have already alluded to the fact that no matter how the mercury is introduced into the system, the constitutional effects are essentially the same. Absorption by way of the mouth is, of course, well recognized; recently, the vagina has been shown to be a frequent point of entry. Absorption through the skin has been open to question, however. Inasmuch as mercurial inunctions have long been employed, the contention has been made that the mercury thus applied is actually volatilized and absorbed through the lungs in greater part if not entirely. In an experimental study, Schamberg, Kolmer, Raiziss and Garvon¹¹⁶ have shown that rabbits may be fatally poisoned by mercurial inunctions, even when no opportunity for absorption through the lungs exists. They noted also that metallic mercury, in the form of the official mercurial ointment, is more volatile and is much more apt to be absorbed by the lungs than are calomel ointments of equal strength; yet the latter are fully as well absorbed through the skin as is the ordinary blue ointment.

The authors point out that while mercurial ointment has been employed

Journal of the American Medical Association, March 23, 1918.

116 Ibid., January 19, 1918.

¹¹⁴ Norsk Magazine for Laegevidenskaben, March, 1918; Jour. Am. Med. Assn., April 27, 1918.

for over four centuries, and its therapeutic efficacy is well attested, its general employment has been restricted because it is extremely dirty, soils the bed and body linen, and thereby discloses the nature of the treatment. They believe that the safest method of introducing large amounts of mercury into the system is by inunction. For this purpose they recommend calomel, as it is far more cleanly, and is, in addition, more easily absorbed through the skin. They have employed the following formula:

R -Hydrargyri chloridi	miti	7.						gr. xlv
Lanolin	- :							gr. xv
Adipis benzoinati .								gr. xxx
Sig.—For each inunction)							

Inasmuch as the calomel has a lesser mercurial content, a somewhat larger dose of the calomel ointment is needed. The following conclusions are drawn:

1. Animal experiments demonstrate that the chief avenue of absorption of mercury, when applied by inunction, is the skin.

2. Rabbits may be fatally poisoned with mercury by inunction, even

when no opportunity of absorption through the lungs exists.

3. Rabbits breathing a mercury-laden atmosphere may absorb considerable quantities of mercury through the lungs, but, as a result of our experiments, we believe the respiratory absorption to be far less important than the cutaneous absorption.

4. Metallic mercury in the form of the official mercurial ointment is more volatile, and is much more liable to be absorbed by the lungs than

calomel ointments of equal strength.

5. Calomel ointments are fully as well absorbed through the skin as the ordinary blue ointment; indeed, we have the impression that calomel is absorbed with greater facility.

6. There appears to be no reason why calomel inunction should not supplant the unclean blue ointment rubbings which have been so long

in use.

Kolmer and Martin¹¹⁷ have reported the finding at necropsy of numerous globules of metallic mercury in the tissues of an aneurysm of the aorta, and the eroded vertebra of the spinal column. Myriads of minute globules of mercury were scattered throughout these tissues, the metal being easily expressed and collected into larger globules in the concavity of the aneurism and eroded tissues. They express the opinion that so far as the deposition of metallic mercury is concerned, it would appear that this occurs by reason of chemical changes in necrotic tissues of syphilitic or non-syphilitic etiology. They quote Blundell as finding scores of globules of mercury in the tissues of a fly blister in the epigastric region in a person who took half an ounce of metallic mercury for eathartic purposes.

For the relief of pruritus ani, Hamburger¹¹⁸ recommends the use of dry calomel. The part is wiped off first with moist cotton, the finger is

Journal of the American Medical Association, May 1, 1918.
 Ugeskrift for Laeger; abst. Jour. Am. Med. Assn., May 18, 1918.

moistened, and the powder is taken up on the finger and rubbed into the crevices. He states that the itching generally subsides permanently, or at least for several months, after four or five applications of the calomel.

Finlayson¹¹⁹ treated 14 cases of paresis by means of mercurial inunctions. Twelve of these cases showed no greater mental or physical changes than would be found in a similar group of untreated cases. One case showed a good remission mentally, but all the serologic findings remained strongly positive. Another case did not improve quite as much, but approached a state termed a remission, and has shown some negative serologic findings.

Finlayson points out that the lack of correlation between the serologic findings and mental conditions leaves little ground on which to

base definite conclusions as to the value of the treatment.

Favre¹²⁰ states that his experience has shown that when *stomatitis* occurs during the administration of mercury, it differs in no respect from that caused by Vincent's spirillum. The taking of the mercury induces local congestion and irritates the bloodvessels. Spirillum infection may exist in a latent form and be stirred into activity by the mercury. Any drugs which will kill the spirilla will cure the stomatitis, even when the mercury is continued. Favre has found *arsenic* and *silver nitrate* the most effective. The arsenic can be given internally or applied locally. For local treatment, silver nitrate is almost specific in its action on the spirilla.

Favre begins by mechanically cleaning the mucosa of the patches and membranes. This is done with cotton-wound toothpicks dipped in 1 per cent. silver nitrate. The ulcerating mucosa is rubbed vigorously and cleansed of all the purulent masses and pseudo-membranes working between the teeth, and thus transforming the inflamed mucosa into a red, freely bleeding surface. The mucosa is then swabbed with a 1 to 15, or 1 to 20, solution of silver nitrate. This is followed by the application of 1 per cent. methylene blue. The initial treatment is always the severest. This treatment is continued once a day and then at longer intervals. The removal of tartar, remedying of dental defects and efficient hygiene of the mouth will prevent a return of the trouble, even though the use of mercury is continued.

Mineral Oil. The use of paraffin oil as a vehicle in the treatment of intestinal disorders has been investigated by Hollscher. ¹²¹ The writer's experience justified the conclusions that the oil gives better results with iodine than without—because observations made regarding the Gram-negative and Gram-positive microbic findings revealed a marked difference before and after taking—and the symptoms of autointoxication were favorably influenced. In gastric and duodenal ulcer, the effects were often quite pronounced regarding the pain, hyperacidity, gaseous distention, and distress occasioned by food. Particularly impressive is the possibility of overcoming hookworm and other intes-

¹¹⁰ American Journal of Insanity, April, 1918.

Lyon Médical, August, 1917.Therapeutic Gazette, 1917.

tinal parasites when the oil is combined with chenopodium, iodine, oil of turpentine, guaiacol, thymol, pelletierine, etc., and, since the oil is not absorbed, one may assume that these rather toxic agents may also pass through the gastro-intestinal tract unchanged. This, however, calls for considerable investigation.

Combined with bismuth subcarbonate, it proved successful in a case of recurrent mucous colitis; it disposed of constipating effect of the

bismuth and quickly brought normal bowel and fecal changes.

He summarizes his results as follows:

First. The iodine is not absorbed into the general circulation because all the known tests that were made to detect it in the urine failed to disclose its presence. This applies to those who had taken the mixture a few days and those who had taken it over six months.

Second. The iodine can be detected in the feces, in all cases—more

so in those who had taken it for months.

Third. No indications of iodism or atoxic effects appeared in any case.

Fourth. The maximum dose that can be safely given is open to investigation. (The first substance tried was iodine in its metallic state. The resultant mixture assumes a violet color and the iodine apparently is thoroughly fixed in the oil. The solution represented 1 gram of iodine to 2 ounces of oil and was given in 0.5-ounce doses once or twice daily. The slightly pungent taste can be overcome by drinking a glass of cold water after each dose.)

Fifth. The laxative effect of the oil is not modified by the addition

of the iodine.

Sixth. The indications for its use are to be found in intestinal autointoxications or intestinal putrefactions. These terms are used for lack

of better descriptive words.

Musterole. A case of poisoning by musterole is reported by Macht.¹²² A woman, because of pain behind one ear, applied musterole to the painful spot. The following day she presented a scarlatiniform eruption over the neck, face, chest, arms and back. She complained of burning and itching, and, in addition, a very marked irritation of the conjunctive was present.

Musterole has been described as being essentially a mixture of lard, or some similar material, with oil of mustard, menthol and camphor.

Oil of mustard is extremely irritating, capable of producing a severe dermatitis, and, if absorbed into the circulation, may cause albuminuria and even nephritis. Macht warns that a mixture containing such an irritant is very apt to be absorbed through the skin, and therefore the indiscriminate use of such oils in salves under fanciful names, without a physician's supervision, should be discouraged, as it may lead to untoward effects, such as the case reported.

Sollmann¹²³ says that most of the solvents for mustard oil hinder its penetration into the skin. The greatest irritation is obtained by watery suspension, for instance in mucilage. Olive oil and turpentine

Journal of the American Medical Association, September 15, 1917.
 Journal of Pharmacology and Experimental Therapeutics, April, 1918.

OPIUM 359

produce practically no hyperemia; ether and absolute alcohol very little; 95 per cent. alcohol causes a distinct, and 50 per cent. alcohol a marked and lasting hyperemia. Mucilage of acacia and simple syrup causes the

most intense and persistent hyperemia.

Nitrite of Amyl. The use of amyl nitrite as a diagnostic agent in cases of mitral stenosis is reported by Morison. In 12 cases in which a presystolic murmur was suspected, but in which there was considerable uncertainty, Morison had the patient inhale the fumes from a 3-minim capsule until an evident nitrite reaction appeared. In many cases of mitral stenosis, in addition to the accentuated first sound, there may be a questionable murmur. In a larger proportion of such cases, Morison found that the amyl nitrite accentuated the doubtful elements in the auscultatory phenomena and made the presence of a murmur plain.

Olive Oil. The use of olive oil is recommended by Asnis¹²⁵ in the following gastro-intestinal conditions: (1) Hyperacidity, no matter what its origin. (2) Erosion, fissures and ulcers. (3) Pyloric spasm, no matter what its cause. (4) Diseases of the biliary tract, such as cholecystitis, and, Asnis ventures to say, cholelithiasis in a limited and selected number of cases. (5) Certain types of diarrhea and dysentery, constipation, dilatation of the stomach due to pyloric spasm, ulceration of the intes-

tines and malnutrition.

Opium. Macht¹²⁶ has made a comparative study of the effects of opium and morphine on the digestive tract. He states that when the action of morphine is studied in a segment or a loop of isolated intestine, it is found that it powerfully stimulates the peristaltic movements and decreases the tonus of the organ, through an action on the Auerbach and Meissner plexuses situated in its walls. A similar effect is produced

by other alkaloids of opium, namely, codeine and thebain.

The sedative or constipating action of morphine, when it occurs, is due to a number of other effects produced by it, and which counteract the above described stimulating action. Of these, the most important are as follows: (1) A spastic contraction of the pylorus. This hinders the passage of food from the stomach into the gut, and in this way deprives the latter of one of its natural stimuli. Magnus, in a very elaborate study, regards this as one of the chief causes of constipation after morphine. (2) There is a similar tonic contraction of the ileocecal sphincter which tends further to hinder the passage of fecal matter. (3) In the third place, there is a diminution in the pancreatic and enteric secretions which also tends to produce constipation. (4) In the fourth place, it is interesting to note that, although the secretions are inhibited, the absorptive power of the intestine is unimpaired. This circumstance, together with the fact that the intestinal contents are propelled more sluggishly, leads to even more complete absorption of fluid and the production of harder feces. (5) In the fifth place, according to Nothnagel, Spitzer, and others, morphine causes an increased tone of the splanchnic nerve centers, and hence a greater inhibition of the intestinal move-

¹²⁴ British Medical Journal, April 20, 1918.

¹²⁵ Proctologist and Gastro-enterologist, June, 1917.

¹²⁶ American Journal of the Medical Sciences, December, 1917.

ments. (6) Lastly, it is claimed by some authors that morphine tends to benumb or paralyze the sensory nerve-endings in the intestinal walls

and thus render them still less responsive to stimuli.

It is thus seen that while the action of morphine on the Auerbach and Meissner plexuses tends to stimulate the intestinal contractions, some of its other effects on the intestine tend to counteract this stimulation and inhibit the contraction, and still other effects, by producing changes in the consistency of the feces, tend still further to lead to constipaton. The fact that small doses of papaverin and narcotin are sufficient to counteract the stimulating action of morphine and codeine explains the empirical observation that opium is more constipating than morphine. Experiments made by Macht with pantopon, a combination which contains 50 per cent. of morphine, proved that it possessed enough of the isoquinolin derivatives to produce an inhibition of the bowel in

place of the ordinary stimulation following morphine alone.

In another study of morphine, Macht, in collaboration with Isaacs¹²⁷ investigated the reaction time of morphine. In the case of morphine alone, or in combination with other opium alkaloids, Macht and Isaacs found that the question of the reaction time depends on the dose used. In man, after small doses of morphine, there is generally a primary stage of stimulation or quickened reaction time; this may, or may not, be followed by a stage of depression, as indicated by narcosis and prolongation of the reaction time. After large doses of morphine, the primary stage of stimulation may be very brief and may be overlooked, while the secondary stage of depression is predominant. The doses which gave the primary stimulation ranged from 4 to 6 mg. The ordinary therapeutic dose of morphine, from 8 to 15 mg. (\frac{1}{8} to \frac{1}{4} grain), is too large to make the primary stage of stimulation very noticeable. In the opinion of Macht and Isaacs, the primary stage of quickening or stimulation probably corresponds to the stage of well-being, so well known to the pharmacologist, which occurs after small doses of opiates. They attribute the greater accuracy of the tests to this sense of well-being besides the slight narcotic effect which, in nervous individuals, was just sufficient to allay their anxiety.

An interesting case of abnormal reflexes caused by morphine poisoning in the tabetic is reported by Osnato. 128 The patient, a man with welladvanced tabes, took eight 4-grain tablets of morphine. Typical symptoms of opium poisoning resulted. In addition, all of the superficial reflexes became exaggerated. He believes that the phenomena which occurred in this case upholds the conception that morphine is a cerebral

depressant and spinal stimulant.

In the treatment of morphine habitues, Loewenthal believes that the essentials of treatment consist in securing the full confidence of the victim; the employment of a trustworthy nurse; and absolute isolation. Upon entrance to the hospital, the patient should be made to undress in one room, and, after receiving a warm bath, he should be put in a

Psychobiology, 1917, i, 19.
 Journal of the American Medical Association, June 15, 1918.
 Cleveland Medical Journal, September, 1917.

hospital gown and removed to another room. In this way the hiding of drugs is impossible. Gradual withdrawal of the morphine is the

method he employs.

In order to overcome the symptoms of withdrawal in the treatment of narcotic habitués, Stokes¹³⁰ recommends the use of pilocarpine and eserine. He employs these drugs for this purpose in doses far below the minimum medicinal doses in common use. The largest single dose of pilocarpine hydrochloride was $\frac{1}{10}$ grain; the average dose was from 15 to 50 grain repeated every two or three hours for the first fortyeight hours, when the medication, as a rule, is discontinued. Soon after beginning the treatment, the face becomes flushed, the pupils narrowed, ptyalism and sweating are induced, the heart action is slowed down, gastro-intestinal peristals is established, the gall-bladder is emptied, the bowels move and the patient is hungry. Refreshing sleep often follows the first dose—indeed, patients often have to be aroused for their medication. If the saliva is swallowed, they are apt to be nauseated. While cathartics are sometimes given, they are not always necessary, and should under no circumstances contain any of the hyoscine-atropine group, which is absolutely contraindicated in this condition. If the pulse is slowed down unduly, it is better to cut down the amounts of pilocarpine and eserine, rather than to lengthen the interval beyond three hours, or stop the medication altogether, for, if this is done, naturally the patient will again develop withdrawal symptoms. It is better then to give or a grain of morphine, and half an hour later to begin the treatment anew, giving the pilocarpine and eserine in reduced doses. Stokes has noted no untoward symptoms in a series of 130 cases made up of the various types of opium addicts.

Parathyroid Gland Extract. This substance is recommended by Berkeley¹³¹ in the treatment of paralysis agitans. The use of the parathyroid is suggested partly because of the symptoms developing in animals upon removal of these structures and partly because of the finding, in some cases, of paralysis agitans, of diseased parathyroid glands. The parathyroid extract, as prepared by Berkeley, comes in small capsules $(\frac{1}{2},0)$ grain of parathyroid extract in milk sugar) and as a hypodermic solution; the latter is marketed in small rubber-stoppered

bottles of 5 mils.

The hypodermic method is the best, but is more expensive. Many

patients do well on the capsules.

The dose by mouth is one capsule two to six times daily, preferably after eating. The hypodermic solution is given in doses of 1 or 2 mils once or twice a day. One mil. of the solution equals $\frac{1}{5}$ grain of the extract. Improvement is, as a rule, slow. The contraindications are very few. Berkeley, in an experience with nearly 100 cases, has had but 1 case in which the parathyroid could not be taken at all. In this instance, an anaphylactic sensitiveness seemed to be the trouble. If the dose is pushed too fast, the tremor may be made worse.

Phosphorus. The effect of phosphorus on growing, normal, and diseased bones has been studied roentgenologically by Phemister. His

Medical Record, June 9, 1917.
 Journal of the American Medical Association, June, 1918.

findings show that phosphorus affects the normal bones of children in much the same way as that which has been observed in experimental animals. The effect on enchondral bone growth is especially well marked. No definite increased transverse growth could be made out, but this might readily escape detection by means of the roentgen rays. Also, for some time after the phosphorus was stopped, there is a continued,

but less-marked, reproduction of bone.

The diseased bones showed certain variations. In osteogenesis imperfecta, the transverse growth was as strikingly affected as the longitudinal. All fractures occurring during the period of observation healed except one at the middle of the humerus, which occurred during the period of interruption of the phosphorus, an inactive stage of non-union being established before removal of the drug. Judging from the general effect it produces, Phemister believes that phosphorus, if given early in fractures during the active period of repair, should stimulate callus formation and ossification.

In chronic non-union cases, however, he thinks little is to be expected

from its use.

In the case of rickets, his observations show clearly that phosphorus, when given alone, had a marked stimulating effect on bone production and consequently of calcium accumulation in the normal zones of growth; these results speak against the assertions which have been made relative to calcium metabolism in healthy children. During the active stage of rickets, the bony tissues have lost the power of depositing lime salts; and, as phosphorus is presumably unable to restore this power, no appreciable effect from its administration would be detectable by means of the x-rays, although it may increase the amount of osteoid tissue formed. During the healing stage of rickets, when the power of laying down lime salts begins to return, the phosphorus would stimulate the formation of osteoid tissue and consequently increase the amount of bony tissue formed. The dose is $\frac{1}{200}$ grain for children four to eight years old. The drug is given in pill form two or three times a day and may be continued for months. The dose after a time may be increased to $\frac{1}{100}$ grain.

Pituitary Extract. The use of pituitrin in obstetrics is still being discussed. Goetsch¹³³ states that, in Williams' clinic at the Johns Hopkins Hospital, the indications for the use of pituitrin are grouped under three heads: (1) In the first place, pituitrin is used in primiparæ only when the head is beyond the spines and on the perineum, thus assuring free passage to the head. In multiparæ, it is frequently used even when the head is at the spines. No bad results have been noted in these cases. The use of pituitary products apparently has caused a reduction in the use of the forceps in this clinic. (2) It is employed for the arrest of postpartum hemorrhage instead of ergot. It acts more rapidly than ergot—inside of three to five minutes—and is always followed by ergot given hypodermically. Ergot is also given by mouth if further bleeding is feared. The reason for this method is that the effect of pituitary

liquid is rather transient, and the ergot is therefore employed to cause continued contraction of the uterus after the effects of the former have worn off. Pituitary liquid is also employed in cases of complete uterine atony after forceps have been applied. (3) The drug is employed in cases of Cesarean section as a prophylactic against hemorrhage. The method of using the pituitrin in these cases is as follows: The syringe is kept ready, the ampoules are previously sterilized, and the injection is given into the posterior wall of the uterus just as soon as the baby is delivered. The action of the drug under these circumstances is very rapid; the uterus contracts powerfully and usually becomes board-like in a minute and a half to two minutes.

The drug is never employed in the primary stage of labor in this clinic. Goetsch emphasizes as the principal danger—rupture of the uterus when the drug is given in the first stage before the cervix is dilated, and particularly in cases of weakness of the uterine walls. The second major danger is asphyxiation of the child in those cases in which rapid delivery subsequently becomes impossible. The drug acts in from three to ten minutes and the effect lasts from three-quarters to one hour. If no effect is produced in fifteen minutes, it is safe to repeat the dose. Goetsch states that frequently it is found that 0.5 c.c. is just as effective as 1 c.c.

Stein and Dover,¹³⁴ from their personal experience, have come to the following conclusions: (1) The use of pituitrin in far smaller doses than the customary ones. (2) The use of small doses of pituitrin in the first stage of labor as well as later on. (3) The use of small doses of pituitrin

for the induction of labor at term.

Most obstetricians will, I think, heartily endorse the first conclusion, but I question whether there are many who would be willing to recommend the drug in the primary stage of labor or as a means of bringing on labor.

In considering the various methods of combating postpartum hemorrhage, Thomas ¹³⁵ states of pituitrin that it gives prompt and satisfactory results. At the onset of any serious hemorrhage accompanied by a flabby, poorly-contracted uterus, pituitrin (1 c.c.) should be used immediately. The action is, as a rule, almost immediate, and although this action may be somewhat transient, still it will hold the uterus until some more lasting drug can assert its influence. Keeping this in mind, Thomas recommends the hypodermic injection of 1 or 2 c.c. of ergot immediately after the pituitrin. He considers pituitrin, solely as an emergency drug in these cases, but, on account of its rapid action, it is indispensable.

When the uterine hemorrhage is due to atony of the uterine muscle, as in postpartum or postabortive cases, the results are excellent. Novak¹³⁶ does not think it is of much service in other types of uterine hemorrhages. When it acts as a hemostat it is because of its action in causing contraction of the uterine muscle, but in those cases in which

¹³⁴ Medical Record, August 11, 1917.

New York Medical Journal, December 8, 1917.
 Medicine and Surgery, August, 1917.

the bleeding is apparently due to an endocrine deficiency, little is to be

expected from it.

Lipkis¹³⁷ has employed successfully small doses of pituitary extract in the treatment of incomplete abortion. He does not curette or use packing. The pituitary extract is given hypodermically in doses of 0.5 c.c. every day or every other day until the placenta is expelled. As a rule, it takes two or three days. Lipkis states that the operative danger in these cases are the danger of infection from the instruments or hands of the operator; the danger of severe hemorrhage; the danger of perforating the uterus; and the danger of cervical laceration. By the use of pituitary extract he believes that the above dangers can be avoided and the mortality materially decreased.

From time to time instances of rupture of the uterus are reported following the use of pituitrin. Such a case is reported by Colistro and Platero. 138 In this instance the labor was unduly prolonged, and, although the pelvis was normal and the child small, the continued pressure had weakened the uterine wall and a rupture resulted. The fetal head was free in the vagina, but the annular contracture above was

almost unconquerable, although morphine was given freely.

The discovery that the administration of pituitary extract exerts a marked influence on the urinary secretion has led to a number of articles on this phase of the subject, particularly its employment in cases of diabetes insipidus. A metabolic study of the effect of pituitary administration in diabetes insipidus has been made by Williams. 139 His conclusions are summarized as follows:

1. A brief resumé of the literature in which most of the recent writers

regard the disease as due to hypofunction of the hypophysis.

2. A clinical description of a case in a woman, aged fifty-eight years, in which the chief symptoms were thirst, polyuria, pain in head, back, and limbs; impaired eyesight, loss of weight.

3. Physical examination; leukodermic patches on arms and chest, dry

skin, body otherwise normal. Patient nervous and irritable.

4. Previous illness negative; family history of cancer, diabetes, and

5. N-ray examination; sella turcica slightly enlarged, anterior clinical processes thin; posterior clinoid processes thin and of mushroom type.

6. Eyes, concentric contraction of visual and color fields, and other changes suggesting a functional disturbance due to physiological factors.

7. Average amount of urine passed daily when no pituitrin was given (78 days), 6277 c.c. Average amount passed daily when pituitrin was given (142 days), 3767 c.c.

8. Diets low in carbohydrates, proteins, fats, and salt had little effect

on diuresis.

9. Administration of anterior lobe pituitary body by mouth was ineffective in controlling diuresis.

10. Administration of posterior lobe by mouth was also without effect. (This seems to contradict statement No. 7—Ed.).

139 Endocrinology, July-September, 1917.

Northwest Medicine, March, 1918.
 Revista Medica del Uruguay, December, 1917.

11. Removal of spinal fluid to lessen intracerebral pressure diminished

diuresis for one day only.

12. The effect of pituitary administration is purely transitory. Its continued use over a period of eight months has afforded no evidence of permanent improvement.

13. The blood-sugar level on a diet rich in carbohydrates was in-

appreciably influenced by the administration of pituitrin.

14. There was a considerable increase in the cholesterin and fat con-

tent of the blood which was uninfluenced by the treatment.

15. The study of the urine excretion by means of the Mosenthal two-hour renal test showed that, when pituitrin is not given, the kidnevs eliminate large and variable amounts of urine during the day, and an even greater amount during the night period. The percentage of solids or specific gravity is fixed on a low plane and fluctuates very little. When pituitrin is administered, much less urine is excreted during the day periods, but the night amount is quite as large as in the previous test. The percentage of concentration of solids in the urine is much greater and more variable. Without pituitrin, nitrogen elimination was quite variable during the day, with a pronounced response to the noon meal, althought the percentage of concentration was fixed during all but two of the periods. The administration of pituitrin seemed to stimulate nitrogen excretion during the latter part of the day and during the night, more than half of it being eliminated during the night hours. Salt elimination is also on a higher plane after the administration of pituitrin.

When pituitrin is not given, salt elimination is on a low plane, there being quite a well-marked fixation of concentration. When pituitrin is administered, both the amount and the percentage of concentration vary considerably, showing that the kidneys have a greater amplitude of function. As in the case of water and nitrogen, more than half of

the salt is eliminated during the night hours.

16. The blood creatinin was normal. The urea content of the blood was normal, and the rate of excretion was apparently improved by the administration of pituitrin, as evidenced by the lower Ambard coefficient.

A case of diabetes insipidus successfully treated with subcutaneous injections of hypophyseal extracts (posterior lobe and pars intermedia) is reported by Barker and Mosenthal. They were able to completely control both the polyuria and the polydipsia, and to raise the concentration of the urine to a normal level. Two doses of 1 c.c. each in the twenty-four hours were sufficient. The patient's nervousness was greatly mitigated and sleep returned. The only other noticeable effect, a bowel movement after each injection: As a result of their experience in this case they conclude that:

1. That diabetes insipidus is to be looked upon as an endocrinopathy, being due to an insufficiency of the pars intermedia of the hypophysis

cerebri.

¹⁴⁰ Bull. Johns Hopkins Hospital, November, 1917.

2. That the symptoms of diabetes insipidus can be controlled by a substitution therapy, namely, by the subcutaneous injection of extract of the posterior lobe and pars intermedia of the hypophysis cerebri.

Additional cases treated in this way are reported by Lereboullet,141

Lafora, 142 and Rosenbloom. 143

In an experimental study on the effect of pituitary extracts on the daily output of urine, Rees144 found that subcutaneous injections of the extract did not alter quantitatively the daily output of urine in cats and rabbits, nor did they cause any marked variation in the specific gravity of the urine. The subcutaneous injection of pituitary extract causes a delay of seven or eight hours before the beginning of the diuresis which follows the ingestion of large amounts of water. This delay, however, does not cause any variation in the total amount of urine excreted in twenty-four hours. The delay in diuresis caused by the injection he attributes, in part at least, to a delayed absorption from the alimentary canal. Furthermore, the subcutaneous injection of pituitary extract has no influence on the diuresis induced by a continuous intravenous injection of istonic salt solution.

Pituitrin has also been shown to have a marked influence on the intestines. Conley 145 points out that, aside from its use in obstetries, pituitrin has several other important indications. One of the most important uses is in the expulsion of gas from the intestines, accomplished by its characteristic action on the unstriped muscles of the intestines. The most frequent indication is in the intestinal paralysis or atony of the gut in postoperative cases. Conley has also used pituitrin under similar

circumstances in pneumonia, nephritis and peritonitis.

Another important use of pituitrin is in ischuria, because of its action on the bladder musculature. It is especially useful in the urinary suppression following abdominal, vaginal or rectal operations and in the ischuria after labor. Conley states that he has never had to catheterize

a woman after labor if he had used pituitrin during labor.

Pimental¹⁴⁶ reports 10 cases in which he was able to regulate the bowel function by means of injections of pituitary extract administered hypodermically. In some instances three injections at a week's interval were required before the movements occurred normally. He failed in one case in which for many years the bowels had only moved after rectal injections.

Kirmisson¹⁴⁷ has had excellent results from pituitary extract in cases of paralysis of the bowel following operations for appendicitis. Additional evidence as to the efficacy of pituitrin in postoperative cases is furnished by Davis and Owens. 148 They have found that the bogey of postoperative gas pains can be laid to rest by the use of pituitrin. As a result of experimental studies, Davis and Owens conclude that:

¹⁰ Anales de la Facultad de Medicina, December, 1917.

Archivos Españoles de Pediatria, December, 1917.

13 Journal of the American Medical Association, May 4, 1918.

144 American Journal of Physiology, March, 1918.

Journal-Lancet, August, 1917.
 Brazil Medic
 Bulletin de l'Académie de Médecine, January 29, 1918.
 New Orleans Medical and Surgical Journal, March, 1918. 146 Brazil Medico, August 4, 1917.

First, that pituitrin is a valuable drug stimulating the muscular coat of the intestine after abdominal section in non-septic cases.

Second, that it is of decided assistance in preventing postoperative shock after abdominal section in non-septic cases, as evidenced by the

lack of rise of temperature and pulse-rate.

Third, that it had very little, if any, effect upon cases complicated with septic peritonitis, but their results in this group are inconclusive. on account of the small number of cases.

Fourth, that it stimulates the secretory action of the kidneys in cases

of eclampsia.

Fifth, that it materially reduces the amount of postoperative suffering. The use of pituitrin as a prophylactic against hemorrhage in tonsillar and nasal operations is recommended by Salinger. 49 He has found that pituitrin, given as a prophylactic before tonsillectomy, will in most cases diminish the amount of blood lost, particularly under general anesthesia. When used for the control of a secondary hemorrhage, pituitrin is a successful agent, acting promptly, particularly in tonsillar and turbinal hemorrhages.

Zueblin¹⁵⁰ reports 4 cases of hay fever in which there was marked circulatory depression and digestive disorders. Under the use of pituitrin and adrenalin these cases showed a reduction in the size of the heart, better heart sounds and improved blood-pressure findings. Symptomatically, the attacks did not return, or were lessened in severity. From the therapeutic standpoint, he believes that pituitrin administered in appropriate doses may remove the cardiovascular depression, and, in some instances, cure, or at least alleviate, the clinical symptoms.

While he does not think that pituitrin is the only treatment for hay fever, or that pollen vaccination is out of place, he does believe that the attendant signs of vasomotor and cardiac weakness ought to be

considered in the treatment of these cases.

Placental Extract. McNeile's experience with the effect of this extract during the first days of lactation did not warrant any definite conclusions. In patients fed desiccated placenta there was apparently some change in the chemical composition of the milk during the first eleven days of lactation. The most marked change was an increase in the percentage of lactose, accompanied by a slight increase in the percentage of protein and a slight decrease in the percentage of fat. There was no deficiency in the amount of milk among the women receiving desiccated placenta, but the reverse was true among those who did not receive it. At the end of eleven days the babies whose mothers received the agent were about four ounces heavier than those that did not.

Potassium Iodide. The intravenous use of iodide of potassium is reported by Simon. 152 He resorted to this method in a patient who was not taking the drug by mouth as ordered. He has employed the intravenous method in 6 cases. There were no symptoms of iodism, and no

152 Bull, d. l. Soc. Médicale de Hôpitaux, November 16, 1917.

Therapeutic Gazette, January, 1918.
 Medical Record, July 7, 1917.
 American Journal of Obstetrics and Diseases of Children, March, 1918.

appreciable by-effects. He began with 0.05 c.c. of potassium iodide in 1 c.c. of water, and gradually increased the dose to 0.9 gm. in solution of 0.25 gm. to the cubic centimeter of water. Elimination of the iodide by the kidneys was tested as follows: 5 c.c. of chloroform were added to 10 c.c. of urine and the addition of 2 c.c. of nitric acid rendered nitrous by the addition of sodium nitrite in the proportion of 10 cg. to 100 c.c. The mixture is then agitated and set aside. The positive response is a violet tint in the chloroform. This simple test is sufficient to indicate the maximum and the end of the elimination of the iodine.

Buchholtz¹⁵³ reports some experimental studies on the absorption of iodides from the digestive tract, their persuage into the blood, and elimination in the urine. According to his experience, they do not seem to be absorbed in the stomach at all. After each dose the amount in the blood rose but soon dropped, indicating that to keep the organism constantly under the influence of the drug requires frequent small doses over the entire day. The elimination in the urine reaches its height in about 2 hours, but the length of the interval is dependent on the promptness with which the stomach contents are passed along. Any benefit the iodine may have in circulatory disturbances are due, in Buchholtz's opinion, to a syphilitic origin of the trouble.

Proteins. During the last few years considerable light has been thrown on the etiology of asthma. In the great majority of these cases, it can be shown that the exciting cause of an asthmatic attack is some protein. The exact protein can, as a rule, be determined by means of skin tests, and, when this is ascertained, the patient can then be immunized. Walker¹⁵⁴ states that asthmatics who are sensitive to the protein found in horse dandruff and in cat hair are relieved by subcutaneous injections of these proteins. He is unable to state how long such relief will last after the treatment is discontinued, but some cases have remained free from asthma as long as five or six months while treatment was continued.

Those who are sensitive to the proteins found in staphylococcus pyogenes aureus and albus are also relieved by the subcutaneous injections of these proteins. In the case of the former, relief continues for five or six months after the treatment is discontinued, but, with the latter, the interval is shorter.

Those who are sensitive to food protein are relieved by omitting the offending substance from the dietary. The subcutaneous injection of

such proteins exerts no curative effect, however.

Walker has found that patients who are sensitive only to closely related proteins are the simplest to treat, while those who are sensitive to several types of proteins which are not closely related are the most difficult to treat.

He stated that there seems to be two types of colds and bronchitis; one type is anaphylactic, and relief or freedom from this attack follows proper treatment with proteins; the other type seems to be caused by bacteria, and frequently vaccines relieve and prevent these.

¹⁵³ Ugeskrift for Laeger, June 24, 1918.¹⁵⁴ Journal of Medical Research, July, 1917.

QUININE 369

Quinine. Deadrick¹⁵⁵ states that the *tannate of quinine*, on account of the small proportion of alkaloid and slight solubility, has been rarely employed in this country in the therapy of *malaria*. In his experience, however, together with the reports of the Italian physicians, he has formulated the following conclusions:

1. The tannate of quinine is almost completely absorbed from the

alimentary tract.

2. It is more slowly absorbed and more slowly eliminated than the other salts of quinine, and remains in the system longer.

3. A small quantity only of the salt is acted upon by the gastric juice, but is largely absorbed from the bowel after contact with the bile and pancreatic juice.

4. It is not absorbed when injected into the rectum.

5. It is better tolerated by the stomach, intestines, and nervous system than the sulphate.

6. The clinical results with the tannate of quinine are entirely satis-

factory.

7. Being nearly tasteless, it is especially adapted to the treatment of malaria in children.

8. It has a good effect upon diarrhea and dysentery complicating malaria.

9. It is several times less expensive than any other tasteless preparation of quinine.

In regard to the method of administering the drug, Deadrick states that there are three chief modes of administration: (1) The method of Torti, a single dose before the paroxysm; (2) the method of Sydenham, a single dose in the decline of the paroxysm; (3) the method of fractional doses. Deadrick believes that the last mentioned method has the following advantages: (1) Quinine given in this way is better borne by the digestive and nervous systems; (2) the loss of one dose by vomiting or failure of absorption is not of so much importance; (3) the method is adapted to tertian, quartan or estivo-autumnal infections; this is important, for sometimes these cannot be differentiated clinically; (4) it is adapted especially to estivo-autumnal infections where sporulation is not so nearly synchronous; (5) the time of administration is not dependent on parasitic findings or definite stages, both of which may be obscure when the patient has previously taken quinine; (6) an experience in many hundreds of cases has proved its value.

Deadrick's method of administration is as follows: The average dose is 1 grain an hour, given usually 2 grains every two hours, 3 grains every three hours, or 4 grains every four hours, night and day. It is especially important that the drug be given during the night, since thus only may the blood be charged during the day, when sporulation occurs. Cinchonism is no guide to the quantity to be given; it is not the patient against which the quinine is directed, but the parasite. The drug should be continued for two days after the subsidence of the fever and in the quantity employed during the fever. Thereafter about 15 grains on two successive

days of each week should be given for at least two or three months to prevent relapse, even though the patient leaves the malarial locality. Deadrick insists that a few days' treatment with quinine no more cures malaria than does a few weeks' rubbing with mercury cure syphilis.

In an extensive study of the effect of the quinine salts in the treatment of malaria, Thomson¹⁵⁶ emphasizes the fact that while quinine still remains the true specific in this infection, it will not cure every case and that no definite and infallible cure for all cases is yet known. This is to be attributed partly to the fact that the vital resistance of the patient may be poor and partly to the fact that the infection in certain portions of the world seems to be more resistant to quinine than others, entirely apart from the particular part of the organism which may produce the infection.

Thomson is firmly of the belief that nothing less than the continuous use of quinine, 30 grains daily given in solution by the mouth for three weeks, can be considered as a curative treatment. Smaller doses administered for a shorter time may seem to have produced a cure, both from the standpoint of the patient and from the examination of the blood, yet, if treatment is stopped at an earlier time, relapses all too frequently occur. It is also advisable, in Thomson's opinion, to continue the treatment for two additional months with smaller doses (15 grains daily). The use of small doses (10 to 15 grains daily) is not advisable in the acute stages of the infection, for, while the parasites may disappear temporarily and the patient appear to be cured, relapses are almost sure to follow.

This opinion is also borne out by the experience of Stephens, ¹⁵⁷ and his co-workers. They studied the effects of doses ranging from 5 to 90 grains in two successive days. Regarded from the curative point of view, that is, the prevention of relapse, no success was obtained when the dosage was less than 45 grains.

In the treatment of the resistant forms of the disease the consensus of opinion seems to be in favor of the intravenous use of quinine. Thomson¹⁵⁸ advocates this not only in the resistant types of the disease but also in those which have relapsed several times in spite of thorough oral treatment.

James^{1,3} selected for the intravenous method certain patients in whom vigorous courses of quinine treatment by the mouth, and intramuscularly had failed to prevent the recurrence of relapses, either very shortly after the cessation of the treatments, or, in 1 or 2 cases, actually during their progress. His chief purpose was to find out whether a course of quinine given intravenously would be more effective in preventing relapses than the other modes of administering the drug. A number of patients were treated with the chief object of ascending the smallest dose of quinine which, when given intravenously, would suffice to cause the disappearance from the peripheral blood of all the asexual parasites of a given generation. His conclusions on this point are as follows:

[&]quot; Journal of Royal Army Medical Corps, 1917.

^{**} Annals of Trepical Medicine and Parasitology, January, 1917. ** Loc. eit. ** Journal of Royal Army Medical Corps, September, 1917.

1. A single dose of 6 grains of quinine bihydrochloride given intravenously at the time of rigor caused a marked reduction, but by no means a complete disappearance, of all the asexual parasites of the generation which caused the rigor.

2. A single dose of 9 grains in the same conditions sometimes effected, but sometimes failed to effect, the complete disappearance of all the

asexual parasites of the generation which caused the rigor.

3. A single dose of 15 grains given intravenously at the time of rigor invariably caused the disappearance of all the asexual parasites which caused the rigor; but

4. The same dose given on the day of interval between two paroxysms

did not effect a complete disappearance.

5. When two or more generations of parasites were present, it was necessary, in order to insure the disappearance of all asexual parasites from the peripheral blood, to repeat the intravenous dose of 15 grains at such times as would insure the presence of quinine in the blood while the parasites of the different generations were sporulating.

6. As regards the rapidity with which a sufficient dose administered intravenously caused the disappearance of asexual parasites from the peripheral blood, a marked reduction in numbers was easily appreciable six hours after the administration, and disappearance was, as a rule,

complete eighteen hours after the administration.

7. As regards the effect upon sexual forms of the parasite, a single dose of 15 grains did not appear to lessen appreciably the number present in the peripheral blood; and in ordinary thin films of finger-blood from 2 patients who had received a daily dose of 15 grains intravenously for four days, gametocytes could still be found without prolonged search.

Rogers¹⁶⁰ points out that while quinine has for long been given intravenously in cases of pernicious malaria with cerebral symptoms, it is often delayed too long to avert a fatal issue. In his opinion, the danger of this method is mainly in delaying its use too long. In a study of the toxicity of the various quinine salts given intravenously, he has come to the conclusion that the bihydrochloride and the acid hydrobromide of quinine are the best salts to use. The latter is much the least toxic and causes less giddiness, but it must be remembered that it contains only three-fourths as much of the alkaloid as the bihydrochloride. As three grains of bihydrochloride contain as much quinine as four of the acid hydrobromide, after commencing with 0.5 gram doses to ascertain whether the patient has any idiosyncrasy toward the drug, up to 12 grains of the bihydrochloride or 16 grains of the acid hydrobromide (approximately 1 gram), in $7\frac{1}{2}$ and 10 c.c., respectively of normal saline (making practically 10 per cent. solutions), may be given once daily for at least four days.

In Rogers's opinion a material advantage of early intravenous administration is likely to be that dangerously severe infections, which may terminate at any moment in fatal coma under oral administration of

¹⁶⁰ Indian Med. Gaz., November, 1917; British Medical Journal, September 22, 1917.

quinine, are likely to be rapidly controlled, and the present mortality

from malaria to be reduced to practically nil.

Thomson¹⁶¹ gives larger doses. Among his general conclusions, he states that this method has special advantages in the treatment of the disease during the periods of activity. By this route and at these times, the full quantity of quinine given can be concentrated against the parasite at the moment when it is most susceptible to its action; and the maximum effect of the drug, within therapeutic limits, can then be obtained. By attention to a simple technic, quinine bihydrochloride in 20 per cent. solution can be safely and conveniently given intravenously up to 15 grains of the salt for a dose—a 5 c.c. syringe and a suitable hypodermic needle being the only special apparatus required.

In 18 consecutive cases of malignant tertian with remittent fever, and with ring forms of P. falciparum present in the peripheral blood, a single intravenous injection of 15 grains of quinine bihydrochloride in 20 per cent. solution was sufficient to break the attack in every case; and, once the attack was broken, doses of quinine by the mouth which had been insufficient to reduce the temperature were not sufficient to keep it down. Ring forms of the parasite quickly disappeared from the circulating blood after the injection, but crescents were not directly

affected.

In 32 consecutive cases of benign tertian, a single intravenous injection of 12 grains of quinine bihydrochloride in 20 per cent, solution given during a paroxysm was sufficient to break the attack so that the paroxysm next in order did not occur. This was so even in those cases in

which a quotidian type of fever was to be expected.

The intravenous injection of a 20 per cent, solution of quinine bihydrochloride in normal saline in the times stated can be relied upon to break promptly an attack of malaria; and although immediate sterilization or even sterilization after any single course of treatment, in cases that have already relapsed several times, is not to be expected, it is reasonable to suppose that, if each relapse is cut short on the day of onset, the patient will stand a much better chance of ultimate sterilization. The shorter the time that the parasite is allowed to go on multiplying, the less will be the risk of secondary changes, also the greater will be the chance of quick and sure destruction of the parasite, and of complete recovery.

The intravenous injection of from 10 to 15 grains of the bihydrochloride of quinine is also reported by Stephens, Yorke, Blacklock,

Macifil and Cooper. 162

Intramuscular injections are the subject of some difference of opinion. Ross has expressed the belief that for severe cases, to judge by experimental evidence, this method is useless. Fox¹⁶³ takes exception to this point of view. His experience in an infected district, such as the Federated Malay States, is distinctly in favor of this method. Stephens,¹⁶⁴

Toc. cit.

^{1/2} Annals of Tropical Medicine and Parasitology, August, 1917.

¹⁶³ Lancet, December 15, 1917.

na Loc. cit.

373 QUININE

and his co-workers, recommend for intramuscular injections the following method: 1 gram of quinine alkaloid is dissolved in 1 c.c. of 90 per cent. alcohol and the volume made up to 3 c.c. with sesame oil. This gives a clear, viscid solution capable of being easily injected, and containing approximately 5 grains of the alkaloid.

In administering quinine, Thomson 165 advises combining with it arsenic in the form of liquor arsenicalis in 2-minim doses three times daily. The dose should be gradually increased to 5 minims three times daily. Falconer and Anderson¹⁶⁶ report favorably on the association of galyl with quinine in the treatment of cases of subtertian cerebral malaria.

In regard to the prophylactic use of quinine, Treadgold, 167 who served with the British forces in Macedonia, does not believe in its efficiency. He says that, speaking generally, quinine prophylaxis is usually a bad investment for immigrants in the absence of protection against mosquitoes. So far as the Allied armies in Macedonia are concerned, there is every reason to suppose that quinine taken daily over periods of many months, has increased the severity and chronicity of the disease in a certain proportion of cases. Taking into consideration the advantages and the disadvantages of quinine prophylaxis, Treadgold believes that the disadvantages outweigh the advantages.

The use of quinine and urea injections in the treatment of exophthalmic goitre is favorably reported by Watson. 168 He states that this treatment has its limitations, as has any other method, but, in properly selected cases, is capable of giving excellent results. If the best results are to be obtained, hyperthyroidal patients must have at least a year of mental

and physical rest after the treatment has been completed.

Quinine is one of the drugs which frequently gives rise to untoward symptoms in those having an idiosyncrasy to it. Sinton has reported 5 cases. He quotes MacGilchrist who stated that, "as regards unpleasant by-effects of these alkaloids, buzzing in the ears was most frequently associated with quinine and quinoidine; amblyopia with quinine and cinchonine; diarrhea with cinchonine if administered over a week; and nausea with quinoidine. Cinchonidine, even in large doses, caused no unpleasantness of any kind." Sinton's cases were as follows: (1) The idiosyncrasy took the form of a marked edema of the face and eyelids, although only 40 grains of quinine had been given in two days. (2) Following a prophylactic dose of 10 grains of quinine sulphate in tablet form, the patient in about an hour's time complained of great itching and had a marked urticarial rash all over the body. The rash lasted four or five hours and was accompanied by very severe headache. Buzzing in the ears lasted two days. (3) After a dose of 5 grains of quinine sulphate in solution the patient developed severe vomiting and diarrhea in about half an hour and a diffuse urticarial rash appeared all over his body after one hour. The rash lasted five or six hours. He also complained of

<sup>Loc. cit.
Lancet, September 22, 1917.
British Medical Journal, May 11, 1918.</sup> 168 New York Medical Journal, September 22, 1917. ¹⁶⁹ Indian Medical Gazette, September, 1917.

vertigo and severe headache. The use of cinchonidine sulphate produced similar, but less severe, symptoms. (4) After the ingestion of 5 grains of quinine sulphate the patient had severe vomiting and diarrhea, with profound prostration. An urticarial rash appeared all over his body and his eyes became very congested. Cinchonidine sulphate in 5-grain doses did not produce any untoward symptoms. (5) A man who gave a history of becoming semicomatose and had severe vomiting and diarrhea whenever he took quinine as a prophylactic was given 5 grains of cinchonidine sulphate in solution. Fifteen minutes later he was brought back to the hospital in a collapsed condition. He was semicomatose, his face and conjunctive were very congested, his pupils dilated and his eyes turned up. He was apparently profoundly shocked, having a temperature of 95° F. A few minutes later, after being given stimulants, he recovered consciousness and complained of chilliness and severe headache. A few hours later an urticarial rash appeared on his body. Headache and buzzing in the ears continued for several days.

Martin¹⁷⁰ reports a case of idiosyncrasy following the injection of 3 minims of a 10 per cent, solution of quinine and urea hydrochloride. The symptoms complained of were swelling of the hands and feet, and numbness of the extremities. For a few hours there was some difficulty in breathing, associated with a tendency to fainting, and some nervous perturbation. Later, an urticarial rash appeared, and was associated with intense itching. The attack subsided in two days. Although the patient had had two previous experiences with quinine, she neglected to

say anything about them.

Among the untoward symptoms of intolerance to quinine noted by Samaja¹⁷¹ hemorrhagic purpura was not exceptional, but the dose of the drug usually was large when this by-effect was observed. In 1 case, however, severe purpura developed after doses of only 1 mg. per kilogram of body weight. The attacks of purpura followed whether the quinine was given orally or subcutaneously. While it did occur after the administration of small amounts of quinine, the intensity of the purpura was more pronounced in proportion to the largeness of the doses.

Elliott¹⁷² has called attention to the fact that, as the result of the war, large numbers of medical officers have been suddenly forced to treat diseases of which they previously knew but little. Among these is malaria. The result has been that quinine has been used in many instances in a careless manner. For instance, he refers to one medical officer who gave 90 grains of quinine a day for seven days, apparently with no idea that such amounts are extremely dangerous.

He has been prompted, therefore, to make an extensive study of the literature on the subject of quinine poisoning, with special reference to quinine amblyopia. He grouped the cases as follows: (1) Cases in which huge doses resulted in permanent damage to the sight. In this group as much as 1694 to 400 or 500 grains were taken in a few days. (2) Cases in which the dosage ranged from 3 drams to half an ounce. In all of this

Indianapolis Medical Journal, January, 1918, p. 23.
 Gazetta degli Ospedali e delle Cliniche, Milan, January 13, 1918.

American Journal of Ophthalmology, August and September, 1918.

RADIUM 375

group the damage to the sight seems to have been permanent. (3) Cases in which the dosage amounted to about 100 grains. Permanent damage to the sight, so far as he could judge from the records, occurred in this group. (4) The same is to be said for cases in which the dosage ranged from 40 to 80 grains. (5) This group represents those in whom there was apparently an idiosyncrasy to the drug. Thus, permanent or, more often temporary amblyopia followed the administration of small amounts of the drug. For example, in a case recorded by de Schweinitz, temporary amblyopia followed the administration of 15 grains of quinine in divided doses in twenty-four hours. (6) Finally, there is a small group in which very serious symptoms or a fatal result followed the administration of very small amounts of the drug. Elliott believes that the time is more suitable to consider the subject of quinine poisoning in all its bearings, to review what has been written and learned, and to raise a note of warning, lest in our endeavor to extinguish the germs of malaria, we should be led into the dangers that surround the abuse of quinine. To save a man from death, only to leave him amblyopic, hemeralopic and with contracted fields, is to render him a poor service indeed.

Radium. The London Radium Institute¹⁷³ has issued a report on the use of radium as a therapeutic agent in *malignant disease*. The report covers the work done from January, 1915, to December, 1916. In all, 1400 cases were dealt with during the two years, but the results of treatment are noted in 1157 only; of these, 52 were cured, 172 were apparently cured, 498 were improved, and 251 did not improve. Treatment was

abandoned in 144 cases, and 76 died.

In dealing with the various types of malignant disease, the report points out that in small epitheliomata affecting glabrous surfaces, the results were encouraging, but similar growths affecting the buccal, laryngeal and pharyngeal membranes give disappointing final results, although temporary improvement is frequently noted. In cases of uterine cancer, the use of radium at times changed an inoperable case into one which was operable.

The results in carcinoma of the rectum vary considerably. As a rule, the results are best in patients over fifty and in whom the growth is

annular, vascular, and situated in the upper half of the rectum.

The report does not favor the use of radium in cases of mammary cancer; these growths had best be subjected to operative interference.

Of all forms of malignant disease, rodent ulcer is the most amenable to treatment by means of radium. Lesions not previously treated by other methods, which do not affect mucous membranes, bone or cartilage, and are small in size, can usually be cured by one treatment.

Sarcomata usually do well if vigorously treated, and if taken in hand

before metastasis to the viscera take place.

Among other conditions favorably influenced by radium, the report mentions fibroid of the uterus, and various skin diseases, namely, lupus vulgaris, pruritus, chronic eczema, psoriasis and x-ray dermatitis.

Turner¹⁷⁴ reports 66 cases treated by means of radium. These include

¹⁷³ Prescriber, June, 1917. ¹⁷⁴ Lancet, 1917, i, 546.

cases of rodent ulcer, inoperable malignant disease, exophthalmic goitre and nevi. He believes that sarcomata are more amenable to radium treatment than carcinomata.

Risley and Leland¹⁷⁵ give the results of their experience in 113 cases of carcinoma of the uterus. They found that much symptomatic relief can be expected from radium, especially in the alleviation of pain and the checking of hemorrhage. They also believe that the postoperative use of radium to prevent recurrences is a safe, logical, and advisable procedure. Life is often prolonged in inoperable cases. In order to guard against recurrences, they advise that patients be seen once a month following the operation for a period of a year; once every three months for the second year; and at intervals for each succeeding year.

In reporting 25 cases of carcinoma of the bladder, Barringer 176 states that 2 were good operative risks but that the remaining 23, because of the size of the tumor, were impossible operative risks. In 4, the growth was locally removed by the radium. Barringer believes that these 4 cases indicate that radium can do as much as surgery. He also reports the results in 30 cases of carcinoma of the prostate. In this condition the radium caused, with surprising regularity, the reduction or disappearance of carcinomatous nodules in both early and advanced cases. So far as has been observed, the reduction in the size of the lobes of the gland is permanent. In addition to the local effect of the radium, there was also a striking improvement in the symptoms. The ultimate effect on the residual urine seemed to be negative, the amount neither increasing nor decreasing.

The reports that have appeared not only during the past year, but in previous years, all go to show that radium is a valuable therapeutic agent if properly used. The technic is important, and it is essential that the method be used only by those thoroughly skilled in its employment. Inasmuch as the cost of radium is a bar to its general use, the establishment of special institutions or departments is the real solution, and in this way individuals can give their undivided attention to its effects. Abbe, who has used radium more extensively than most, has been strongly impressed with the results of Wickham, of Paris, in the postoperative use of the agent. He believes it should be employed in all cases

in which a recurrence is to be expected.

Pancoast¹⁷⁷ believes that in the treatment of inoperable malignant growths originating in cavities such as the mouth, throat, and ear, radium is an extremely valuable adjunct for the reason that it can be applied directly to the growth, which is more or less inaccessible to direct roentgen-ray exposure. But this alone is not sufficient, and the growth should also be attacked from every possible direction by cross-firing, either by radium or by roentgen rays, or both. Any nearby area in which metastasis is likely to occur should also be exposed. Sarcomatous growths, especially in the tonsillar region, are more amenable to treatment that carcinomas. Pancoast believes that it is advisable to produce

¹⁷⁶ Ibid., September 27, 1917. 177 Journal of the American Medical Association, September 22, 1917.

¹⁷⁵ Boston Medical and Surgical Journal, December 27, 1917.

RADIUM 377

as rapid subsidence of the growth as possible in order to minimize the possibility of metastasis during the period of treatment. His experience has seemed to prove that growths insufficiently treated at the periphery may be stimulated to more rapid proliferation at this portion. It is advisible, in his judgment, to continue the treatment for some time after the complete disappearance of the growth. Holding and Long¹⁷⁸ especially emphasize the importance of the preoperation and postoperation use of radium or the x-rays. They believe that no case of operable tumor has had the benefit of all that can be done unless such a procedure is followed. All instances of inoperable tumors, of whatever nature, should be given the benefit of radiotherapy. Admitting that a cure is more or less improbable, this method does more to relieve these poor sufferers from pain, fetid discharge, etc., than anything else and it often prolongs life for a period varying from months to years.

They urge that hospital authorities, and medical boards in particular, be urged to adopt a more enlightened attitude toward radiotherapy. Although radium is expensive, the roentgen rays, compared to the good

they do, are very inexpensive.

Burnham¹⁷⁹ has reported 8 cases of *mediastinal growths* treated by means of radium. With one exception the patients continuously improved and in several cases from two to four years had elapsed since the disappearance of the tumor. In about half the cases there was some nausea for a day or two following the treatment. The subjective

symptoms were usually greatly relieved.

The use of radium in the treatment of myelogenous leukemia is considered by Giffin¹⁸⁰ and Peabody. ¹⁸¹ In 25 patients Giffin states that there was definite improvement of the anemia concomitant with the improvement of the general condition. The reduction of the number of leukocytes was due chiefly to not only an absolute, but also a striking relative, fall in the myelocytes; there was also a marked fall in the absolute count of polynuclears, while their relative percentage remained approximately the same. There was also a marked fall in the absolute count of small lymphocytes.

Marked temporary improvement occurred in 26 patients, and a remarkable improvement in 13. Sufficient time has not elapsed to

determine the ultimate results.

Peabody is impressed with the marked improvement which occurs in the general condition of these patients. He found that while it is comparatively easy in most cases to bring the leukocyte count down to normal, it is much more difficult to keep it there. A remission usually takes place after a few weeks, and more radium must be applied. The attempt was made to treat patients soon after the white count began to rise, and, by the use of radium, he found it possible to keep the count from 5000 to 40,000 or 50,000.

The use of radium in 2 cases of myelogenous leukemia and 1 of lym-

¹⁷⁹ Ibid.

¹⁷⁸ Journal of the American Medical Association, September 22, 1917.

¹⁸⁰ Boston Medical and Surgical Journal, November 15, 1917.¹⁸¹ Ibid., December 20, 1917.

phatic leukemia is reported by Elliott. 182 The results obtained are considered remarkable by Elliott and seemed to be more effective and certain than other methods employed. The white cells rapidly returned to within normal range, and pathological white cells largely disappeared from the stained smear. There was also a decided increase in the number of red cells and hemoglobin.

The spleen and lymph nodes rapidly decreased in size and the microscopic appearance of the one spleen removed following radium treatment showed no leukemic infiltration, as is usually seen in such spleens.

The weight, general health, and general well-being of the patients all

improved to a remarkable degree.

The action of radium on the hematopoietic system has been studied by Millet and Mueller¹⁸³ in 10 cases of squamous-cell carcinoma of the cervix and vagina. They found the immediate effects of radium on the blood are as follows: (a) An immediate drop in the total white count. reaching its maximum from one-half to six hours after the application. (b) A return of the total white count to its former level within twentyfour hours after the application, usually within the first twelve hours. (c) An occasional secondary rise of the total white count to a point well above its original level from twelve hours to three days after the application. (d) A close adherence of the total polymorphonuclear count to the curve of the total white count. (e) An absence of characteristic changes in the total lymphocyte and total large mononuclear counts. (f) A tendency of the total lymphocyte count to follow in some degree the fluctuations of the total white count, especially when these are marked. This effect is not constant. (q) A tendency of the relative lymphocyte count to drop, and of the polymorphonuclears to rise during the course of treatment. This tendency is reversed during the period immediately following the removal of the radium.

Remote effects of radium treatment on the blood are as follows: (a) Early. (1) Fall in lymphocyte count from two to four weeks after treatment, sometimes lasting till the end of the second month. (2) Fall in polymorphonuclears after treatment, sometimes simultaneous with the fall in lymphocytes but usually coming later and being less striking. (3) An attempt of the lymphocytes to recuperate, as shown by a rise in most cases at some later date, varying from three to nineteen weeks after treatment, to the approximate level seen before treatment. (b) Late. (1) Change in the relative counts as the patient's resistance weakens, with increase in polymorphonuclears and decrease of lymphocytes, but without leukocytosis. (2) Terminal leukocytosis, due in the main to increase of the absolute polymorphonuclear count, although usually accompanied by an absolute decrease in lymphocytes.

In the treatment of exophthalmic goitre, Gordinier states that the mild or incipient cases are curable by prolonged rest, hygienic and medical means. Fifty per cent, of the more advanced cases are curable by the same methods. If, after the rest treatment has been given a fair

¹⁸² Medical Clinics of North America, March, 1918.

^{18.} Journal of Cancer Research, April, 1918.

¹⁸¹ Therapeutic Gazette, June, 1918.

trial, no improvement is shown or pressure symptoms appear, a surgeon should be called in.

Sufficient has been written upon the subject of rest in the treatment of tuberculosis to make it superfluous to further mention the subject. And yet in spite of its known value there is no measure in the handling of the disease that is so neglected by the general practitioner. Furthermore, the value of rest is likely to be obscured by reason of the fact that the strenuous training in the army camps is being cited as a wonderful thing for latent or even early tuberculous cases. An article by Cornich¹⁸⁵ emphasizes the fact that the corner-stone of the treatment of tuberculosis is rest. Rest for the cure of inflammation, as measured by fever; rest continued for some time after the complete subsidence of fever; when extreme nervousness coexists, as it often does, rest, even to the point of seclusion.

Salicylates. The following interesting historical note on the use of the salicylates in the treatment of acute rheumatic fever has been contributed by Cannon. He states that in 1862, while on a British war vessel, he had a case of acute rheumatic fever and, being a thousand miles from a drug store, he wanted to prescribe quinine. He found, however, that he had none but did have some salicin, then hardly used in medicine. This he administered, with good results. Maclagan stated that the idea of treating acute rheumatic fever with salicin occurred to him in November, 1874.

In the eighth article of a series dealing with the action of the salicylates, Hanzlik and his co-workers, Scott and Reycraft, 188 take up the subject of salicyl edema. They state that following the administration of full therapeutic doses of salicylate there is a rather marked diminution in urine output, reaching its greatest depression about ten to twenty hours after the symptoms of toxicity appear, and persisting for about forty to seventy hours after the administration of the drug. The output of urine reaches its previous level roughly about the time excretion of salicyl is completed. They state that two possible explanations are suggested for this: (1) Sweating; (2) retention of water, that is, edema; the important factors to be considered in retention are (a) the tissues, and (b) the kidneys. As the result of a clinical study they conclude that:

1. The anuria produced by the administration of full therapeutic doses of salicylate is due to retention of water as indicated by an increase in

body weight unless modified by diaphoresis.

2. This retention is demonstrable about twenty hours after the start of the administration of the salicylate, and persists until the salicyl excretion is completed, that is, about eighty hours (three and one-third days).

3. The retention occurs chiefly in the tissues, for no dilution of the

blood is demonstrable by estimations of hemoglobin.

4. The edema is accompanied by a diminution in phenolsulphonephthalein excretion together with an accumulation of urea nitrogen of

185 Texas State Journal of Medicine, March, 1917.

Lancet, June 16, 1917.
 Lancet, June 16, 1917.
 Archives of Internal Medicine, September, 1917.

the blood, and increased excretion of albumin, all of these elements reaching their previous levels with the disappearance of the edema.

5. There is, therefore, a diminution in renal functional efficiency, and since this generally makes its appearance before an actual increase in body weight is demonstrable (edema) and later coincides with it, it seems that the renal factor plays an important role in the production of the edema.

6. These phenomena are not modified by the administration of sodium bicarbonate together with the salicylate, and in doses sufficient to maintain the urine alkaline.

Acting on the fact that many authorities believe that sodium salicylate is eliminated by the synovial membranes, Impallomeni¹⁸⁹ conceived the idea that it might be of value in warding off sepsis in case of a wound of the joints. Following this suggestion, he claims to have obtained excellent results. A dose of 0.5 gm. is given by mouth at the first dressing and this treatment is continued later on. Even better is to administer the drug subcutaneously or intramuscularly. The formula found best adapted for injection purposes a mixture of 1 gm. of sodium salicylate; 0.01 gm. stovaine; 0.04 gm. sodium chloride, and enough 25 per cent. glycerine water to make 10 c.c. The vial containing this is heated to 212° F. for twenty minutes.

Serum Treatment. ANTHRAN. During the past two or three years a number of reports have appeared in the South American Medical Journals on the use of normal beef serum in the treatment of anthrax. The Argentine, being a great cattle-raising country, has suffered more severely from anthrax in recent years than any other part of the world. The use of beef serum in the treatment of anthrax is ascribed to R. Kraus¹⁹⁰ head of the bacteriological institute of the National Department of Health. The method is simple. It consists of the intravenous, intramuscular or subcutaneous injection of from 20 to 30 c.c. of serum previously heated twice for half an hour at 56° C. Kraus is reported to have treated 90 cases without a death. Penna and Kraus¹⁹¹ at first used prepared immune serum but found, to their surprise, that the normal beef serum was fully as effectual. Their results in 50 cases corroborated the experimental work of Kraus and Beltrami in protecting rabbits against anthrax by means of normal beef serum. Confirmatory evidence of the value of beef serum is furnished by Solari. 192

In a third communication, Kraus, in association with Penna and Cruenca, ¹⁹³ report on 140 cases with the loss of but one. At first they used the serum intravenously, but found that the subcutaneous method was equally effective except for the severest cases. The dose ranged from 10 to 30 c.c. for the average case, up to 40 or 50 c.c., for the severe cases. The dose is repeated on the next and the following day at need. In the 9 severe cases detailed in their report success followed a single injection

Abstract, Journal of the American Medical Association, November 10, 1917, p. 1657.

La Prensa Médica Argentma, December 30, 1916, and February 10, 1917.

¹⁹¹ Ibid., March 10, 1917.

Semana Medica, Buenos Aires, July 26, 1917.

¹⁹ La Prensa Médica Argentina, August 20 and September 30, 1917.

of from 20 to 30 c.c., with the exception of 1 case in which the initial lesion was on the neck. In this case the first dose was 50 c.c., and 30 c.c. was given later the same day on account of the alarming symptoms.

Liquiéres¹⁹⁴ asserts that he has been unable to confirm the claims of Kraus and his associates. He reports extensive experiments all apparently proving his contentions that Kraus has been misled. He points out the natural prevalence of anthrax in cattle and believes that if their serum possessed any natural defensive properties it should protect them against the disease. In his opinion, if the normal beef serum possessed the value Kraus claims for it, a prepared immune serum should have been correspondingly more effectual.

The treatment of wounds by means of normal beef serum is reported by Shortell, Cotting and Leavy. 195 Used as a dressing, no matter how large the wound surfaces are, it gives rise to no anaphylactic response. The authors state that whenever contact is made between the serum dressing and the infected tissue, the serum will control a septic process.

DIPHTHERIA. Two articles on the active *immunization of infants* against diphtheria have been contributed by Zingher. He states that the indications for active immunization may be divided into two groups: (a) As a general prophylactic measure, and (b) to control outbreaks of diphtheria.

He advocates that all infants below twelve, and, if possible, below eighteen months of age, should be actively immunized with three doses each of 10 c.c. of toxin-antitoxin and that these injections should be given irrespective of the Schick test the infants may show at the time of immunization. In fact, in infants below eighteen minths of age the Schick test is not a necessary part of the procedure, since all the infants should be actively immunized anyhow.

The injections are given subcutaneously in the arm or below the angle of the scapula, and repeated every seven days. Inasmuch as the toxinantitoxin is well tolerated by young infants the dose in the same as that given to older children.

All children over eighteen months of age, as well as all youths and adults, should be tested with the Schick reaction first, and only those giving a positive reaction immunized with toxin-antitoxin. The toxin-antitoxin mixture should be prepared in a reliable laboratory and carefully tested for potency in the guinea-pig before it is sent out for use.

Zingher would accomplish the active immunization through the agency of private physicians in the different homes, where a majority of the infants can be reached. In large centers of population the milk stations, day nurseries, children's dispensaries, infant and orphan asylums furnish large groups of children suitable for immunization. Children in kindergartens and those of school age should be tested first with the Schick reaction, and those giving a positive test actively immunized.

¹⁹⁴ Revista de la Asociación Medica Argentina, September, 1917, and La Prensa Medica Argentina, July 10, 1917.

¹⁹⁵ Boston Medical and Surgical Journal, November 1, 1917.

¹⁹⁶ Journal of Infectious Diseases, November, 1917; American Journal Diseases of Children, August, 1918.

Adults, especially those frequently or constantly exposed to diphtheria, such as physicians, nurses, orderlies and patients in contagious disease hospitals, should also be tested with the Schick reaction and those found with a positive reaction actively immunized.

EPIDEMIC POLIOMYELITIS. Two interesting reports on the use of immune horse serum in the treatment of epidemic poliomyelitis have appeared during the past year. The serum is obtained by immunizing horses with a coccus which is believed by Rosenau to be the chief etiological factor in the disease. Of this there is some question in the minds of a number of bacteriologists. Disregarding this controversy it is

interesting to note the results obtained with the serum.

Rosenau¹⁹⁷ has treated 58 patients. Of these, 10 died, a total mortality rate of 17 per cent. Excluding 7 of the fatal cases, in which patients were practically moribund at the time the treatment was instituted, there were 3 deaths, a mortality of 6 per cent. This is in marked contrast to 23 untreated cases in which 9 patients died, a mortality of 35 per cent. Paralysis did not develop in a single instance when the treatment was begun before its onset, and all recovered. According to Draper, about 50 per cent. of proved cases develop paralysis if untreated. Rosenau makes a comparison of results of preparalytic cases by immune human and immune horse serum. Eighteen per cent. of 54 patients treated by Zingher with immune human serum developed paralysis, with no deaths. Twenty-nine per cent. of the 14 cases treated by Amoss and Chesney developed paralysis, and 14 per cent. died. Thirty-one per cent, of 51 cases in Peabody's series developed paralysis, and 10 per cent. died. In Rosenau's series of 16 preparalytic cases, none developed paralysis and none died.

Rosenau believes that, while conclusions are difficult to draw, the serum used appeared to have a prompt and powerful beneficial effect in a large percentage of the patients treated. It is apparently harmless.

Another paper on the use of immune horse-serum is contributed by Nuzum and Willy. 198 Their report deals with 159 cases. Of the 159 patients receiving serum in all stages of the disease, 19 died, a mortality of 11.9 per cent. Among 100 cases occurring during the same period of time, in which the serum was not used, 38 died, a mortality of 38 per cent. They believe that this series of treated cases suffices to demonstrate the harmlessness of serum treatment when the serum is free from globulin, sterile to repeated cultures, and the injections are slowly made and all known rules of precaution are observed. The serum appears to possess the power of definitely preventing the onset of paralysis when administered early in the disease. It also is more definite in arresting the extension of paralysis and diminishing the severity than in effecting its disappearance. The serum should be injected intraspinally in small doses and at the same time intravenously in large amounts. The temperature is employed as a guide to dosage.

In regard to intraspinal injections of immune human or horse serum

⁻ Journal of Infectious Diseases, April, 1918.

[&]quot; Journal of the American Medical Association, October 13, 1917.

in this disease, Rosenau¹⁹⁹ states that these are known to be irritating and at times dangerous. They may produce, to quote Draper, "severe pictures of meningeal irritation, with vomiting, opisthotonos and sometimes convulsions." Peabody warns against intraspinal injections in patients who have already developed paralysis. Moreover, intraspinal injections of serum increase the susceptibility of monkeys to intravenous inoculation of virus (Flexner and Amoss). Hence, any good which follows intraspinal injections of immune serum occurs in spite of these previously undesirable and, at times, probably harmful effects.

Altogether, Rosenau gave 94 intravenous injections. In no instance was there a primary toxic action noticeable, and in only 6 (10 per cent.) was there later evidence of serum disease. If the temperature was normal, no rise occurred; if above normal, an immediate drop without an initial rise was the rule, especially early in the disease. In this respect the action of the serum differed from that following intraspinal injections of immune human serum (Zingher, Amoss and Chesney, Draper, and Peabody) or immune horse serum (Nuzum and Willy) when, owing probably to the toxic action of the serum on the meninges, there is often first an initial rise in temperature and then a drop.

Meningitis. Ker²⁰⁰ reports on the occurrence of serum sickness following the injection of Flexner's antimening occoccic serum. Of this number, 48 lived nine days or over, and 36, or 76 per cent., suffered from serum sickness. As a rule, there was considerable fever, and, in all, a rash which most often started as an urticaria and changed into a multiform erythema. More than a third of the total reactions commenced on the ninth day. In those patients in whom the senses were not blunted, there was much skin irritation. Severe arthritis was noted in 6 patients. Cervical adenitis was noted in 2 cases. In 9 instances there was a prodromal fever which came on twelve to twenty-four hours before any other symptoms. Ker found it was not unusual to find that the use of certain consignments of horse-serum was followed by the appearance of an unusually large number of rashes, and it was generally admitted that the blood of some horses was more irritating than that of others. He considered that this might be the explanation of the large number of reactions following the use of this particular serum of Flexner's. Ker thought that the reactions were of benefit rather than otherwise, as many of the patients seemed much improved by them.

Rolleston²⁰¹ reports 96 bacteriologically proved cases of cerebrospinal meningitis treated by intrathecal injections of serum. Of those surviving ten days or more, 58, or 60 per cent., had a serum reaction as judged by the appearance of a rash. In 9 instances the rash was preceded or accompanied by a more or less definite return of the meningitic symptoms. These symptoms are relieved by lumbar puncture. Rolleston states that under the assumption that these symptoms point to a relapse, a fresh injection of serum may be given, as was done in 6 of the 9 cases. The 3 patients not so injected recovered, while of the 6 given intra-

¹⁹⁹ Loc. cit. ²⁰¹ Ibid.

thecal injections, 5 were made worse and 4 eventually died, though it is not suggested that death was thus induced.

In regard to meningism due to serum disease, Rolleston states that injection of serum into a healthy intrathecal space sets up an aseptic chemical meningitis, whereas injection of antimeningococcal serum in cerebrospinal fever reduced the inflammatory process, presumably destroying the meningococci. He points out that it is desirable to have some means of determining whether there is a genuine relapse which would be benefited by serum, or whether the condition was one of meningeal irritation or meningismus and a manifestation of serum disease which might be intensified by a further injection of serum. This distinction can be made by examination of the cerebrospinal fluid for the presence of meningococci and also for the normal reducing agent (glucose), which is absent in the meningism due to serum disease. It did not appear to result from large quantities of serum given, nor could it be explained as due to an intrathecal injection within a very few days of the appearance of the serum rash, but was probably connected with some hypersensitiveness of the meninges.

Capogrossi²⁰² reports 27 cases of meningitis in which he resorted to intraspinal serotherapy. He believes the prognosis can be regarded as favorable when the patient is young, and the cerebrospinal fluid is milky and under high pressure, with few germs, and these all intracellular. He believes that in such cases recovery is frequent after lumbar puncture alone. In 2 of his cases the cerebrospinal fluid was so thick and purulent that it would not flow. In one case 7 c.c. of the patient's own serum was injected intraspinally twice, but the result was fatal. In a second case 20 c.c. of the spinal fluid was withdrawn, and 10 c.c. of the patient's serum was injected. The fever subsided at once and the patient recovered. He suggests that when antiserum is not available, this procedure might be practical, and that it might also prove a valuable adjuvant when the commercial serum is long-continued.

Fairley and Stewart²⁰³ report on an experience with over 450 cases of cerebrospinal meningitis. They emphasize the point that the best treatment now available consists in the repeated hypodermic, intravenous or intrathecal injection of antimeningococcal serum in relatively large doses. For intrathecal injections the dose should be about 30 e.e.; but the patient should receive about 200 c.c. of the serum daily for several days if he is seriously ill, and in all severe cases the initial dose should be 300 c.c. administered subcutaneously. Whether intrathecal injections of the serum are given or not, lumbar puncture and the removal of 50, 70, or even 100 c.c. of cerebrospinal fluid is to be performed daily.

They believe a further improvement in the serum therapy consists in the intrathecal employment of antimeningococcal serum reënforced by the addition of human serum taken from convalescent cases of the discase. The advisability of this is suggested from the fact that it is known that cerebrospinal fever is difficient in antibodies, particularly comple-

Policlinico, October 21, 1917.

²⁰³ British Medical Journal, September 22, 1917.

ment. The use of human immune serum will contain complement and thereby render the bacterioptic action of the antiserum more effective. As a rule, 5 e.c. of human serum are injected, together with 20 c.c. of the antimeningococcal serum. This line of treatment is said to be promising but as vet is not statistically demonstrable.

The intravenous method of administering the serum is reported on by Herrick.²⁰⁴ As the result of his experience in a camp epidemic of 208 cases, he concludes that treatment by large amounts of antimeningococcic serum intravenously, combined with active spinal drainage and intraspinal serum administration has reduced the duration of the disease, the number and severity of complications and the mortality.

The total mortality in his series of 208 cases was 26 per cent. In the 129 cases treated by intraspinal methods alone or with intravenous serum doses of 10 to 45 c.c., it was 31.7 per cent.; in 79 treated by larger amounts of serum intravenously and average or smaller amounts intrathecally, 16.4 per cent. The mild cases do well by either method of treatment, but in the severe types the intravenous method gives the most striking results. In addition, this method apparently reduces the complications.

In a second article, Herrick²⁰⁵ reports on the results of treatment in 265 cases. Of these, 137 were treated by the older methods of intraspinal therapy alone, or combined with extremely small amounts—from 10 to 45 c.c. of serum intravenously, amounts of serum when given by vein have, in his experience, little, or no value. Of the 137 patients treated by the older methods, 47 died, a mortality of 36 per cent. Of the 128 treated by combined intraspinal and massive intravenous serotherapy, 19 died, a mortality of 14.8 per cent.

In an analysis of 241 recorded deaths from cerebrospinal meningitis, Syk²⁰⁶ believes that failure is to be ascribed either to inadequate doses of serum, or the physician yielded to the patients' demand not to give any more serum or the physician took a hopeless view of the case. Five died apparently as the result of anaphylaxis.

Injection of the serum directly into the lateral ventricle is reported by Laroche.207 In 2 cases in which he resorted to this method, 1 died and 1 recovered.

Tetanus. As has recently been pointed out,208 that the successful treatment of tetanus is still very unsatisfactory. On the other hand, it emphasizes the fact that the prophylactic treatment of this disease has given remarkable results. The recognition of suspicious wounds is most important. In previous issues of Progressive Medicine it has been repeatedly pointed out that the wounds most to be feared are those contaminated by street dirt, particularly puncture wounds or those which earry street dirt deep into the tissues. For this reason "Fourth of July" wounds are especially prone to be followed by tetanus if not

²⁰⁴ Archives of Internal Medicine, April, 1918.

²⁰⁵ Journal of the American Medical Association, August 24, 1918. ²⁰⁶ Svenska Lakaresallskapets Handlingar, September, 1917; Abstract in the Journal of the American Medical Association, January 12, 1918.

²⁰⁷ Archives de médecine et de pharmacie militaires, June, 1917.
²⁰⁸ Boston Medical and Surgical Journal, October 18, 1917.

properly cleaned, and it is in this type of wounds that prophylaxis has

given the most brilliant results.

Generous incisions of all suspicious wounds, and the injection of tetanus antitoxin are the two means of preventing the development of tetanus. The injections of the antitoxin are best made into, or around, the principal nerve supplying the region of the wound. The usual prophylactic dose of tetanus antitoxin is 1500 units. In Europe, where the question of economy is a vital one, the prophylactic dose is often as low as 20 units and has given satisfactory results.

During the first year of the war the literature was filled with reference to the prophylactic use of tetanus antitoxin. The infrequent appearance of articles on the subject during the past two or three years probably speaks in favor of the view that this menace to the troops

has been successfully combated.

SCARLET FEVER. The use of serum from convalescent patients in the treatment of scarlet fever is reported by Weaver.²⁰⁹ The blood was taken from the twentieth to the twenty-eighth day, only such convalescents being selected as were free from all suspicions of tuberculosis, who had not been septic, and who gave a negative Wassermann reaction. The serums of several patients were mixed, tested for sterility, and placed in a refrigerator in portions suitable for a single dose.

The serum was injected intramuscularly in the outer side of the thigh in doses of from 25 to 90 c.c.; the usual dose was 60 c.c. As a rule, a single dose was given; if, however, the desired effects were not obtained, a second injection was given. There were no local or general

disturbances.

Weaver employed this method in 19 cases. The effects noted were quite constantly a fall of temperature which began in from two to four hours after the serum was injected and which continued gradually until its limit was reached in twelve to twenty-four hours. In the purely toxic cases the temperature fell to normal and showed little tendency to rise again. In those with septic complications, the initial fall also occurred, but the fever rose again and ran a course such as occurs in septic cases. More striking than the fall in the temperature was the improvement in the general condition, especially in the purely toxic cases. The delirium subsided, the pulse became slower and of a better quality, and the cyanosis disappeared. In twelve to twenty-four hours patients who had seemed almost hopelessly sick were apparently on the road to certain recovery. Septic cases coming under treatment late were not improved by the treatment.

A second article on this subject is contributed by Kling and Widfelt ²¹⁰ Of 237 cases treated with convalescent serum, all recovered except 10.5 per cent, who died early in the treatment and 7.2 per cent, who succumbed later to complications. The total mortality was thus 17.7 per cent, while the mortality in a corresponding group of 91 severe

cases not given serotherapy was 70 per cent.

Journal of Infectious Diseases, March, 1918.
 Hygica, December 31, 1917; abstract in the Journal of the American Medical Association, March 30, 1918.

The changes in the general condition mentioned by Weaver²¹¹ were

also noted by Kling and Widfelt.

Of the cases treated the second day of the disease, over 93 per cent. recovered; all of the 3 treated the first day; 88.8 per cent. the third day; 76.9 per cent. the fourth day; 50 per cent. the sixth; all but one of the eighth treated the seventh day, and the one patient treated the ninth day, but the one treated on the tenth day died.

Horse Serum in the Treatment of Marasmus. An interesting communication on this subject is made by Freeman.²¹² He reports in some detail the cases of 6 children, all about two months old and weighing 5 or 6 pounds. A variety of feedings were tried continuously, but without obtaining any results. They were given 10 to 20 c.c. of horse serum, with an almost immediate improvement. In giving subsequent injections of the serum, Freeman states that it is necessary to test the child for sensitization. To do this, a drop or two of horse serum is injected, and if an urticarial rash develops the child may be considered as being sensitized and no more serum is given.

In addition to 6 cases of marasmus, Freeman also employed horse serum with beneficial results in a case of hemophilia, one of tuberculosis (with marked loss of weight) and one of otitis media with high fever.

PNEUMONIA. In recently published statistics of the Metropolitan Life Insurance Company, it has been shown that the death-rate from lobar pneumonia is slowly, but steadily, rising. The records of the Health Department of Philadelphia for a number of years past also show a gradually increasing mortality from this disease. For years, tuberculosis held undisputed first place in the mortality returns, but of late years it has alternated with lobar pneumonia and cardiac vascular diseases. In considering the increase, it is to be borne in mind that, in complicated cases, it is probably due to increased accuracy of diagnosis and recording.

Shattuck and Lawrence²¹³ have analyzed the methods of some 4000 odd cases of pneumonia treated at the Massachusetts General Hospital from 1822 to 1917. This study shows that there has been an increase in the death-rate from 10 per cent. in the first decade to 28 per cent. at

the present time.

In the analysis of these cases, it was apparent that treatment has done nothing toward diminishing the mortality from pneumonia in the past ninety-five years. Shattuck and Lawrence conclude that no change is to be expected in the results of treatment until a specific is discovered which will neutralize the toxins of the pneumococcus. They believe that the results so far obtained from the case of antipneumococcus serum are encouraging, but limited, and until its use becomes accepted, the treatment of pneumonia must be that best suited to the individual.

In considering the results obtained from the use of antipneumococcus serum, the *Medical Record*, November 10, 1917, states that, so far, the most promising results have been obtained by Cole and his co-workers at the Rockefeller Institute. So far, the only effective serum is that for

Loc. cit.
 Archives of Pediatrics, October, 1917.
 Boston Medical and Surgical Journal, February 21, 1918.

the Type I infections, but, as about one-third of the cases coming under their observation have been associated with this type of infection, it is worth while having a serum which is apparently capable of reducing the mortality from 25 to 7.5 per cent. Trials of the serum in other hospitals in New York, Boston, Philadelphia, and Pittsburgh have also give satisfactory results. Nichols, in a series of 65 cases treated on the Mexican Border, reports 5 deaths, a mortality of 8 per cent., while of 18 cases of the same type of infection not treated with serum, 7 died, giving a mortality of 39 per cent. Reports from the various army camps during the past year are also in favor of serum in the Type I infections.

The best that can be said at the present time is that the serum in Type I infections is distinctly promising of good results. The chief difficulty is that the method is available only in hospital cases, or in those exceptional ones in private practice in which all laboratory facilities are instantly available. Once this method becomes of unquestioned value it is likely that means will be forthcoming to make it accessible

to those lacking the equipment now necessary.

Friedländer and Rumels²¹⁴ have published a paper in which they consider the reactions following the use of antipneumococcus serum. In a series of 200 cases they observed a noticeable reaction in but 2 cases during the giving of desensitizing doses. In one case there was slight nausea lasting for ten minutes after the injection of 4 c.c.; in the other, there was a small area of urticaria about the site of the injection after the injection of 2 c.c. of the serum. In both cases the reaction following the therapeutic dose was very mild.

In administering the serum, they used, as a rule, 100 c.c. This is diluted with 100 or 150 c.c. of normal salt solution, heated to slightly more than the body temperature and slowly injected into a vein. The conducting tubes are kept warm with hot water bottles. The serum should be injected so slowly that at least half an hour will be consumed

in the process.

The reactions which may follow the therapeutic use of the serum are extremely varied and differ in individual patients with different doses. There may be a reaction following the initial dose and none after the second; or the first dose may cause no reaction and a marked one will follow the second dose. The reaction may occur within ten minutes after the serum begins to enter the vein, or it may be delayed for some time after the treatment has been given.

Friedländer and Rumels state that the typical reaction may be divided into four stages occurring in rapid succession and a series of secondary symptoms occurring some days later. They characterize these stages as follows: (1) The irritability. (2) The stage of shock. (3) The stage of hyperpyrexia. (4) The stage of relaxation. Any of these stages may be very slightly apparent or even absent entirely. The stage of hyperpyrexia is not always well-marked, although some evidence of high fever is practically always present. If any stage be absent, it is more apt to be the symptoms of shock.

In a consideration of asthma complicating the serum treatment of pneumonia, Alexander²¹⁵ states that pneumonia patients with "horse asthma" reacted differently to infections of antipneumococcus serum, depending on whether they were sensitive to horse hair and horse serum. or to horse hair alone. In the first instance, not even small subcutaneous injections of serum could be tolerated, whereas in the latter, no reaction occurred until considerable quantities of serum had been given, although the cutaneous test with serum had been negative. Alexander believes that this suggests a close relationship between one or more of the horseserum proteins and those of horse hair. Patients sensitive to serum or hair could be desensitized so that eventually doses of serum sufficient to produce curative effect on the pneumococcic process were given. He does not believe, therefore, that asthma contraindicates the use of antipneumococcus serum. There were few, or no, manifestations of serum sickness in asthmatic patients, even after as much as 350 c.c. of the serum had been used; whereas in non-asthmatic patients, serum sickness almost always occurred.

Silver. In prescribing one of the silver salts it is always to be borne in mind that the prolonged use of this drug may result in chronic poisoning or argyria. There are certain types of chronic diarrhea which seem to be rebellious to any form of medication other than one of the silver salts. The late William Pepper had such a case, and although the patient was warned as to the probability of her skin becoming discolored, she preferred this to the annoyance of the diarrhea. Although she took the silver for some time, it apparently caused but little trouble in this way until she removed to California. Constant exposure to the sun's rays apparently intensified the action on the skin, for her face and hands became almost black in color. Stengel has had a similar experience in the case of a man suffering from an obstinate diarrhea apparently of arteriosclerotic origin. Although warned, the patient preferred the possibility (later the reality) of changes in the color of his skin to the annoyance of the diarrhea. Steiger²¹⁶ has reported 4 cases of general argyria following medication with silver salts. He also alludes to cases occurring in men or women working in silver. In one case the argyria was restricted to the conjunctiva as the result of the local application of silver nitrate for the treatment of trachoma. He urges research on silver poisoning, as better understanding of this might throw light on numerous questions as to absorption and elimination. In his cases, silver was found in the stools and, in some cases, in the blood, but never in the urine.

Sodium versus Potassium. With few exceptions, physicians prescribe by preference the potassium rather than the sodium salts. The Chicago Chemical Bulletin, May, 1918, believes it is the result of custom, tradition and prejudice. An editorial article in the Journal of the American Medical Association, June 1, 1918, p. 1601, gives three reasons why sodium should be substituted for potassium:

1. By avoiding as much as possible the use of that which goes into

²¹⁵ Archives of Internal Medicine, October, 1917.

²¹⁶ Correspondenz-Blatt f. Schweizer Aerzte, September, 1917.

ammunition or other war-time channals; especially if there is a scarcity, it will help win the war.

2. Therapeutically, the sodium salts are, on the whole, as good as

potassium salts, and, in some instances, better.

3. Sodium salts are much cheaper than the corresponding potassium compounds. Physicians should acquire the habit of prescribing sodium

compounds in preference to potassium compounds.

Strophanthus. Rowe²¹⁷ has made an experimental study of the experience of the method of administration upon the degree of toxicity of strophanthus preparations. He states that the serious difficulties encountered in hypodermic usage demand that further attention be drawn to the somewhat peculiar action of strophanthus preparations in order to emphasize and thereby minimize the danger attending their hypodermic or intravenous administration. He, therefore, selected four strophanthus derivatives which have been, or might be, used hypodermically, namely, Kombé strophanthin, ouabain (gratus strophanthin), tincture of strophanthus, U. S. P., and strophanthone dilute. The toxicity of each was carefully determined by three different methods of administration, namely, oral, subcutaneous and intravenous.

Strophanthin for hypodermic or intravenous use is usually placed on the market in 1-mil. ampoules of a 1 to 1000 solution. The activity of such a solution of the average Kombé strophanthin, according to tests upon frogs, is just equivalent to that of strophanthone dilute in 1-mil. ampoules. For intravenous administration, 0.5 mil. of such solutions should be large enough to produce the desired therapeutic effect.

Ouabain, or gratus strophanthin, has been recently recommended for hypodermic or intravenous use because of its purity and supposed uniformity. Rowe states, however, that recently published tests show a lack of uniformity of samples of ouabain, but the *average* activity is about twice that of Kombé strophanthin, and, consequently, it should be borne in mind that only half as large a dose should be given.

In an extensive clinical study of the indications and contraindications for intravenous injections of the strophanthus group, Vaquez and Lutembacher²¹⁸ conclude that ouabain is a very potent drug, and, if wrongly used, is dangerous. Fatalities have been known to follow its use.

Rowe concludes that the subcutaneous and intravenous toxicities of the four strophanthus preparations tested are from 45 to 100 times as great as their oral toxicities. It has been demonstrated, also, that the satisfactory oral dose is not a true index of the potency of strophanthus. To obtain the most uniform and satisfactory therapeutic results, strophanthus preparations should be administered hypodermically. Extreme caution should, however, be exercised in selecting a sufficiently small dose for subcutaneous and intravenous injection.

In cases of *cardiac failure*, Price²¹⁹ states that intravenous injections of strophanthin may be used in urgent cases when a more speedy result is desired than is possible by the administration of one of the digitalis

Therapeutic Gazette, August, 1917.

²¹⁸ Archives des Maladies du Coeur, October, 1917.

²¹⁹ Practitioner, November, 1917.

series by mouth. He employs one dose of $\frac{1}{100}$ grain, or two or three doses of $\frac{1}{250}$ grain every two hours. This may be followed by tincture of digitalis by mouth. The dose recommened by Price seems to be very large. Thomas Coonwall, 220 who writes enthusiastically in regard to strophanthus, recommends strophanthin hypodermically in doses of $\frac{1}{1000}$ grain every four hours. In cases of mitral stenosis, with marked failure of compensation associated with auricular fibrillation, he gives the strophanthin hypodermically in doses of $\frac{1}{500}$ grain, or even $\frac{1}{200}$ grain. With this he often combines morphine, in order to allay the dyspnea and restlessness. In less severe cases of broken compensation he gives the tincture of strophanthus in doses of 2 or 3 minims every four hours. Coonwall has found strophanthus far superior to digitalis in the treatment of advanced myocardial degeneration.

He insists that strophanthus must be given in the proper dosage, and except in emergencies, this seems to be much smaller than that usually recommended. There is reason to believe that when given in excessive doses, especially if long-continued, it can injure the heart perhaps more

than digitalis does.

Theocin. This drug has been highly recommended by Christian as a diuretic. After employing it in a variety of cases, he concluded that it had little or no effect in those cases in which there is little or no edema, but, in diseases of the cardiorenal systems in which edema is present. theorin is of distinct value. The drug frequently produces dizziness, and nausea and vomiting may result from taking it by mouth. Cadbury²²¹ has reported 2 cases in which the use of the drug was followed by signs of heart failure and death. In 1 case 1 gm, of the powder was divided into three parts and given at two-hour intervals. Soon after taking the powders the patient developed marked dyspuea and precordial distress. The pulse-rate, which was previously 98 and of good volume, rose to 135. The patient became progressively worse, and died a few days later. In the second case the theorin was given with excellent diuretic results. Because of a recurrence of the edema the theorin was again resorted to. As in the first case, signs of cardiac failure developed, and the patient died.

Thromboplastin. Mannheimer and Wang²²² have used thromboplastin and euglobulin in the treatment of tuberculous hemoptysis. They conclude from their experience that these substances are of little value in

the treatment of this condition.

Bankart²²³ has found *coagulose* very effective for the control of bleeding during operations. Coagulose is an amorphous powder precipitated from normal horse serum. Bankart states that coagulose has also been used subcutaneously at the Queen's Hospital of Children in cases of melena neonatorum, hemophilia and other persistent bleeding. It has proved so successful that it has practically become the routine treatment for such

²²⁰ Medical Record, September 15, 1917.

Journal of the American Medical Association, January 5, 1918.
 American Review of Tuberculosis, October, 1917.
 Proceedings of Royal Society of Medicine, December, 1917.

cases. It has the advantage of not having to be freshly prepared as does serum.

Thyroid Extract. In the genital hemorrhages of women, the causes of which are obscure, Hayd224 recommends the use of thyroid extract, at least until a diagnosis can be definitely established or the best kind of subsequent treatment decided upon. In the amenorrheas of young girls, when the periods are irregular, scanty, or absent, Hayd relies upon thyroid feeding in gradually increasing doses. The usual hygienic measures should also be carried out.

If the uterine bleeding is of hypothyroid origin, Novak²²⁵ states that the treatment is simple enough, consisting essentially of the administration of thyroid extract. Its use should, however, be carefully supervised by the physician. Excessive dosage gives rise to the characteristic symptoms of hyperthyroidism, such as tachycardia and tremor; and, if the abuse of the drug is protracted, serious injury may be inflicted upon the cardiovascular system.

The average dose of thyroid extract in cases of mild hypothyroidism should never exceed 5 grains a day, and in most cases it should be less. The patient should be kept under close observation. The effect on the heart especially should be watched. If the heart-rate is not accelerated. it may be assumed that no hypothyroidism exists. If, on the other hand, it is found that the use of the thyroid extract is accompanied by a gradually increasing pulse-rate, together with tremor and nervousness, the dose should be cut down. For prolonged administration, 1 or 2 grains daily is often sufficient.

Another guide to the action of thyroid extract is the effect on the body weight, which is nearly always diminished. It is seldom advisable if the loss of weight is greater than 2 or 3 pounds a week. The total amount of weight which can be safely lost will depend upon the initial weight, upon the duration of the treatment as well as the associated measures. such as dietetic regulation, exercise, etc.

In the favorable cases the menstruation becomes normal within a month, and, in addition, the general improvement is marked. The thyroid medication should not be discontinued abruptly. The dose should be gradually reduced and small doses only should be continued for some time.

Transfusion.—In a review of 280 transfusions, Meleney and his associates state that this procedure is of real value in cases of hemorrhage, in clean operative cases, in pernicious anemia and in some secondary anemias. They do not believe it to be of much value in septic operative cases, cases of bacteremia or cases of acute leukemia. At the present time there does seem to be a large number of severe anemias admitted to our hospitals. During the past summer in the University Hospital there were as many as nine at one time. Some years ago they would all have been classed as essential enemias but with one exception they were apparently secondary, although of a very severe type. Focal infections

²²⁴ New York Medical Journal, December 8, 1917.

Medicine and Surgery, August, 1917.
 American Journal of the Medical Sciences, November, 1917.

play an important part in the etiology, especially those having their origin in the teeth. Cleaning out the mouth and then performing transfusion at times bring about an amazing transformation. It would seem, however, that if the source of the trouble is allowed to go undisturbed too long, the interference with the blood-making apparatus is permanent and transfusion brings about no change for the better or at best only a transient improvement.

In regard to post-transfusion reactions, Meleney and his associates noted them in 63.6 per cent. of the 280 cases studied. These reactions vary in degree but all had a rise of temperature of 100° F, or more. The recipient in good general condition is more likely to have a reaction than one in poor condition. The blood relationship of donor and recipient and the blood group of the recipient seem to have nothing to do with the occurrence of the reaction. The use of small amounts (less than 200 c.c.) are less likely to be followed by reaction than are transfusions of larger amounts. The more transfusion a patient has, the more likely is a reaction to occur, especially if the same donor is used a number of times. The blood of some donors is more apt to cause reaction than that of others.

In some cases of post-transfusion reaction there is a marked polymorphonuclear leukocytosis. The authors do not know whether this is due to intramuscular hemolysis or to the formation of a toxic product from the partial splitting of a foreign protein. They believe, however, that it seems likely that one of these phenomena is probably responsible for most of the reactions.

Blood transfusion has also proved of the greatest service in combating shock. In the use of this procedure in civil life the greatest care is taken to exclude the presence of syphilis and other infectious diseases in the donor; precautions are also taken to avoid the production of hemolysis by the mixing of incompatible bloods. In war surgery, however, these objections are often waived on the ground that the urgency of the situation justifies this. This stand is taken by Fullerton, Dreyer and Bazett²²⁷ and more recently by Robertson and Watson.²²⁸ The latter state that many patients admitted into the casualty clearing stations are inoperable because of shock following the great loss of blood. In two of these cases hemolysis hastened the death of the patient; in one of these the citrate method was employed. While admitting the possibility of hemolysis, Robertson and Watson believe that this danger is slight in comparison with the danger of operating on a shocked and exsanguined patient. In a series of 36 cases of severe hemorrhage they believe that the transfusion was life saving in 22; immediately beneficial in 9, although all of this group died from infection of operation; of no benefit in 3; and harmful in 2 (hemolysis). Although the mortality in this series is high the authors are of the belief that, with one possible exception, all of these patients would have died without transfusion.

As a war emergency Arneuille²²⁹ advocates the collection of the blood

²²⁷ Lancet, May 12, 1917.

<sup>British Medical Journal, November 24, 1917.
Bull. de l'Acad. de Méd., February 12, 1918.</sup>

of the donor through a needle and then reinjecting it similarly into the recipient, thus avoiding any incisions or serious vascular injury. This procedure is to withdraw 300 to 500 mils, of blood from one of the veins at the bend of the elbow. The blood as it runs out is collected in a sterile receptacle containing about 0.1 gram of sodium citrate for each 100 mils, of blood to be withdrawn. Enough water will be present in the receptacle if the citrate is merely dropped in it in the dry state and the vessel then sterilized in the autoclave. The receptacle should be continuously shaken while the blood is dropping into it. The withdrawn blood may then be injected into the recipient from a wash bottle connected with a rubber bulb as though an intravenous saline injection were being given. By this method the blood may be kept at 37° C, as long as four days without producing harm to the recipient.

In this connection it is interesting to note a study of anaphylatoxin and anaphylaxis made in the Hygienic Laboratory of the University of Michigan.²³⁰ Among other things it was noted that a normal blood which in a given dose is perfectly harmless, provided it is injected at once, may become acutely fatal if it is kept in the syringe for about three minutes. The precoagulation toxicity is due not to the injection of fibrin ferment but to the formation of anaphylatoxin. After the removal of the clot some of this poison persists in the serum. Hence it is that a serum always possesses a certain degree of toxicity. The degree of toxicity depends to some extent upon the mode of defibrination. It may also depend upon conditions which affect the animal. Thus, perfectly normal rabbits will yield sera of varying toxicity; the serum of one may have no effect when injected in a dose of 6 c.c., while that of another may kill in a 1 c.c. dose. It is noteworthy that in cachectic conditions the toxicity of the blood is greatly increased.

It is further pointed out in this study that the addition of *sodium* carbonale to a serum renders it incapable of producing anaphylatoxin, and the further fact that the addition of this alkali to anaphylatoxin itself tends to destroy it. It is pointed out that the above facts may serve as a basis for the rational use of alkali as a curative and preventive agent in those conditions which are due to the blood disturbances

in which this poison forms.

In another study on the untoward effects which may follow the injection of whole blood or a serum, Bond²³¹ has noted a definite alteration to occur in the blood serum which seems to be associated with recovery from albuminuria in the nephritic cases, and successful resistance to general infection in wound cases. For the most part this change has been in the direction of an increased hemagglutinin content. The bearing of this fact on the problems of blood transfusion Bond believes now becomes apparent. If the blood serum of a recipient may be at one time compatible with the red cells of a given donor, and at another time may agglutinate those cells, the donor's serum may also, as the result of recovery from infection or other illness, change in the same way.

Bond quotes observations of others in which the transfusion of blood

Surgery, Gynecology and Obstetrics, October, 1917.
 British Medical Journal, March 2, 1918.

from the same donor to the same recipient had no harmful effects on one occasion, but was followed by death on a second. He suggests that changes in the hemagglutinin-content, and probably in the hemolysiscontent of the blood serum of the recipient or donor, or both, occurred in the interval between the two transfusions, which were responsible for the unfortunate result.

In the selection of suitable donors for transfusion, Lee²³² recommends the following procedure: A small amount of blood is collected from a patient (1 c.c. from the ear or finger) and allowed to clot. One drop of serum obtained from this is placed on a slide and mixed with a drop of a suspension of blood of the donor taken in 1.5 per cent. citrate solution. (A few drops of blood are taken into approximately ten times the amount of 1.5 citrate solution and shaken. It is very important that the blood be dropped directly into the citrate, and should not be coagulated partially.) Under the microscope, in the event of a positive test, marked agglutination will be evident. In the event of a negative test it is a wise precaution to raise the cover-glass, and after making sure that the serum and cells are well mixed, to examine the preparation again. The only possible source of confusion is the appearance of rouleaux of the red corpuscles, indicating a too thick emulsion. If the test is negative, transfusion may be regarded as entirely safe.

Tuberculin. In previous issues of Progressive Medicine, the relative merits of tuberculin have often been discussed. In nearly every instance it was pointed out that to those unfamiliar with its use it was almost impossible to come to any intelligent understanding of its merits by reason of the extraordinary divergence of opinion. The

opinions reviewed below are no exception.

Ringer²³³ attributes two advantages to tuberculin treatment, namely, direct and indirect. Of the direct advantages, he states that the first is its effect as an immunizing agent. The second lies in the fact that cases treated by means of tuberculin are less likely to relapse than those not subjected to this method of treatment. In regard to this latter statement it may be said that very good evidence has been produced to show that this statement is more a belief than an actual fact. The indirect advantages are given as follows:

1. Tuberculin therapy exercises a marked psychic effect upon the patient. The patient feels that something is being done for him over and above the tiresome routine of bed rest or chair rest and limited exercise. The weekly or bi-weekly hypodermics produce a marked impression and act as a stimulus to take the cure more conscientiously.

2. Tuberculin therapy enables the physician to keep a closer watch over his patient (a) generally and (b) locally. (a) It aids generally in that the patient is seen more often than would be the case were he not taking tuberculin, and therefore habits and mode of life can be more frequently investigated. (b) It aids locally in that frequent examinations of the lung lesion become purposeful instead of being more or less

²³² British Medical Journal, November 24, 1917.
²³³ Southern Medical Journal, February 1, 1918.

perfunctory, and therefore slight changes are more apt to be detected and their significance appreciated.

3. Tuberculin therapy enables the patient to exercise more careful observation of himself.

We strongly suspect that much of the advantage of tuberculin therapy, at least insofar as pulmonary cases are concerned, lies in these "indirect advantages." One who is equally careful without the use of tuberculin will probably, and as a matter of fact does, obtain equally good results.

Bushnell²³⁴ is convinced that he has too often seen serious harm from tuberculin, as employed by others, to be enthusiastic concerning its use. In his opinion, tuberculin is most helpful to those who need help least. Advanced cases of tuberculosis are very seriously injured by it. Early and latent cases, the types in which tuberculin have been largely used, are able to tolerate and are sometimes apparently benefited by it. Bushnell emphasizes the fact that tuberculin in the hands of the ignorant is a terribly deadly weapon. He believes that cases of genuinely active tuberculosis are more often harmed than benefited by it and is of the opinion that better results in the long run for the average patient are attained by the psychical treatment. He is therefore opposed to its use in army hospitals.

Baldwin's²³⁵ conservative views are summarized as follows:

Tuberculin is an agent of limited application with safety when employed in quiescent pulmonary tuberculosis.

It is not immunizing in the sense that relapse is prevented, although it may diminish the number of febrile exacerbations during the course of the disease.

It is contraindicated in active, progressive, pulmonary tuberculosis. It can be used with benefit in reacting doses for certain localized or circumscribed tuberculosis.

Turpentine. The value of turpentine in the control of hemorrhage is emphasized by Allan.²³⁶ He points out that although the value of turpentine applied locally for hemorrhage is well known, it is not as frequently employed as it might be. It has the advantage of being generally available, or at any rate easily obtainable. It seems to be particularly valuable in the oozing type of hemorrhage. Allan states that there is one practicable point in using turpentine for the control of hemorrhage, and that is the gauze should not be applied saturated with superfluous fluid. The gauze should be used soaked in the turpentine, but prior to application to the affected part it should be thoroughly squeezed and wrung almost dry; otherwise results will be disappointing. Allan has employed turpentine with success when other drugs have failed, and considers that this remedy deserves fuller recognition in the routine treatment of capillary hemorrhage.

Tyramin Hydrochloride. This is the active principle of ergot and is credited with having a favorable influence on the circulation by raising the blood-pressure. The dose is from 40 to 80 mg.

²³⁴ American Review of Tuberculosis, July, 1918.

²³⁵ Therapeutic Gazette, March, 1918. ²³⁶ Practitioner, February, 1918.

Hewlett and Kay²³⁷ have reported on the effects of this drug on the normal circulation and have also studied its effects on circulatory failure during infections, and during, or after, operations. In 4 patients who showed evidence of circulatory failure during the course of infectious disease, repeated injections of tyramin were given. Aside from a transient rise of blood-pressure and an increase in the size of the pulse no change was noted, and in no instance did permanent improvement occur.

In 7 patients who showed evidence of circulatory failure during or after operation, repeated injections of tyramin were given. These usually caused a transient rise of blood-pressure and an increase in the size of the pulse. Striking improvement occurred in the general condition of some of these patients; 5 recovered, and in 3 of these the drug benefited a condition which to those in attendance seemed desperate.

Hewlett and Kay also employed tyramin to abort asthmatic seizures, but it failed, although epinephrin and atropine were subsequently used with benefit.

Vaccines. Adamson²³⁸ deprecates the indiscriminate use of vaccines in all sorts of complaints and with no very accurate knowledge as to whether such a procedure is going to be harmful or not. While each year adds a little to our knowledge of the therapeutic affects of vaccines, the results obtained are very variable.

In a study of prophylactic inoculation in man against the typhoidparatyphoid group of organisms, Davison²³⁹ states that when a mixed vaccine is used the immunity obtained for each of its constituent bacilli is at least as good as, and very often greater than, that obtained against any one of these organisms when it is employed alone in the same dosage for a first immunization.

When single vaccines are employed in succession and the immunizations are carried out independently, the response is greatest to that vaccine which is introduced first. To the later immunizations with other microörganisms the specific response is almost aways less intense.

ARTHRITIS. Miller²⁴⁰ has treated 175 cases of acute and chronic arthritis with a foreign protein. He used typhoid vaccine almost exclusively as a foreign protein; in a few cases proteose and chicken serum were used in a sufficient number of cases to show that the results are apparently the same as with the typhoid vaccine. Commercial vaccines were found to be unreliable on account of the variable amount required to give the desired reaction. With freshly prepared vaccine, from virulent typhoid, the dosage ranged from 40 to 150 million. When beginning the use of a fresh supply of vaccine, its toxicity was determined by commencing with a dose of 40 million and then increasing until the amount required to give the desired reaction was ascertained. Following the injection the patient within a few minutes to one hour has a chill, usually quite severe, with marked rise in temperature, 104° to 105° F. The rise

²³⁷ Archives of Internal Medicine, March 18, 1918; Journal of American Medical Association, June 15, 1918.

238 Lancet, August 10, 1918.

²³⁹ Archives of Internal Medicine, April, 1918.

²⁴⁰ Journal of the American Medical Association, September 8, 1917.

in the temperature does not persist for more than a few hours and the patient suffers no great inconvenience. At times there is nausea and severe headache; the former transient, the latter rarely lasting more than twenty-four hours.

In acute arthritis it is not unusual to note a most remarkable improvement in the joint symptoms by the time the patient is through sweating. Immediately after the injection there is usually a slight leukocytosis which, during the chill, drops to normal or below. Following a violent reaction there may be a leukopenia; this is brief. This is followed by a rapidly developing leukocytosis, which reaches its maximum in four to twelve hours, gradually returning to normal in from twenty-four to forty-eight hours. As a rule the leukocytosis is from 15,000 to 20,000, but it may reach 100,000 or more. The blood-pressure at the time of the chill is usually moderately elevated; immediately after the chill there is a rapid and decided drop, reaching its maximum about six hours after the injection and then gradually returning to normal.

Miller emphasizes the fact that these violent reactions are not without danger. In one case of alcoholism with arthritis, delirium tremens followed the injection, and death occurred in fifty-four hours. In three other patients, all alcoholics, marked delirium developed soon after the

injection, in one instance continuing for thirty hours.

In regard to results, Miller states that thirty-three of the acute arthritis patients had been under active salicylate treatment before receiving the foreign protein, without benefit. All but four of these were promptly, at least temporarily, greatly benefited by the typhoid vaccine.

Eighteen patients with subacute arthritis received the treatment. Fourteen of these were definitely benefited. Recurrences here were common, but, in conjunction with the protein, an effort was made to clear up any foci of infection. Four weeks after the treatment several of these

patients had not suffered from a relapse.

Twenty-eight patients with chronic arthritis received the treatment. Only those were treated in whom there was definite evidence of acute recurrence of the infection. Definite temporary improvement was quite frequently observed, and in a few cases, one of two years' duration, the patients received such benefit that they were able to return to work. The results on the whole were sufficiently suggestive to warrant a continuance of the treatment in selected cases.

Miller states that the chief objection to the continuance of the foreign protein therapy is the danger of grave or fatal reaction. Its careless administration must be carefully guarded against. This form of therapy must be considered as still in the experimental stage, and should not be generally applied without a careful consideration of the dangers associated with it. If used, the toxicity of the particular vaccine must be determined, and the patient carefully examined, especially for cardiovascular pathologic conditions. Failure to observe proper precautions may place this treatment in unwarranted disrepute.

Snyder a has found that intravenous injections of foreign proteins are

[&]quot; Archives of Internal Medicine, August, 1918,

apparently more efficacious than the usual drug treatment for the relief of cases suffering from acute, subacute, and chronic arthritis. In some cases there is a tendency to recurrence, with symptoms milder in type, but a large proportion of these patients can be greatly benefited by intensive treatment. The percentage of these recurrences is no larger, if as large, as are seen in the patients treated by drug therapy. There is no evidence up to date that the foreign protein injections have an

injurious effect on the kidneys.

Whooping Cough. The vaccine treatment of pertussis has been favorably commented on during the past year. Shaw²⁴² is of the opinion that the vaccines are of unquestioned value as a prophylactic measure, and that they should be administered to every child exposed to the disease. Luttinger did not encounter a single severe reaction in over 3000 injections and this has been the experience of Shaw, who has administered large doses to infants six weeks old. He therefore believes that the vaccines can be considered harmless. The dosage employed by Shaw for prophylaxis was the same as for treatment, namely, 500 million. first injection, 1 billion for the second, 2 billion for the third, giving the injections every second or third day. He states that he has given 1 billion every two days for ten days, with good results.

The results from the vaccine in the treatment of cases already in the paroxysmal stage are not as striking as in prophylaxis, although it does seem to shorten the paroxysmal stage and lessen the severity of the paroxysms. An analysis of 112 cases in which the vaccine was the only treatment used, shows that in 36 per cent. in which this method was employed the course of the disease was shorter than the usual duration of the whooping stage although no effect was noted on the number and severity of the paroxysms. In 52 per cent, there were fewer paroxysms, and of lessened severity, especially at night. In 12 per cent. no improve-

ment was noted.

During the past two and a half years, Gray²⁴³ has employed vaccines in the treatment of whooping cough. He reports satisfactory results. He obtained his best results with a preparation containing 250 million of the Bordet-Gengou bacillus without the addition of pneumococci which some vaccines contain. With this preparation he was able to reduce the paroxysms, lessen the vomiting and hasten recovery. Most of his patients were debilitated, badly nourished and underfed children, six years of age and under.

Bogert²⁴⁴ reports the successful use of pertussis vaccine as a prophylactic in a children's home. No reactions were noted and but one child

complained of a sore arm.

Hueneken's²⁴⁵ observations with the complement-fixation test in 17 cases would theoretically justify the prophylactic use of the vaccine. In none of the cases treated with small doses could any antibodies be demonstrated, but when large doses were employed, antibodies were

²⁴⁵ Ibid., October, 1917.

²⁴² New York State Medical Journal, January, 1918.

Practitioner, January, 1918.
 American Journal of Diseases of Children, April, 1918.

demonstrated in 44 per cent. of the cases. The freshly prepared vaccines were, apparently, more effective than the stock vaccines, as 60 per cent. of the patients so treated gave positive fixation reaction. From this he concludes that it is possible to immunize children against pertussis if

sufficiently large doses of freshly prepared vaccine be used.

ASTHMA AND HAY FEVER. Walker²⁴⁶ employed vaccines in the treatment of bronchial asthma in 15 cases. These he divided into three groups: (1) Six patients whose serums agglutinated strains of staphylococcus pyogenes aureus in a high titer. These patients were treated with vaccines of this organism. All the patients of this group were relieved of the asthma and all associated symptoms. (2) Six patients were treated with a diphtheroid vaccine because their type of organism was the predominating one in their sputa, and because there was no positive evidence in favor of any other kind of treatment. Only one patient in this group was relieved. (3) Three patients who indicated that conditions or diseases quite remote from bronchial asthma may play some part in the cause of bronchial asthma, or at least may produce symptoms which simulate bronchial asthma. In one case in this group an operation for hernia relieved the asthma; in another, epinephrin relieved the symptoms; a third case was associated with pituitary disease. Walker believes that it is quite possible that so-called bronchial asthma in patients who are sensitive to proteins is not true bronchial asthma and that cardiac, renal, pulmonary and pituitary disease all may cause symptoms which simulate bronchial asthma.

Ferry²⁴⁷ reports the use of *pollen extract* in the treatment of 127 cases of hay fever. He concludes that when single extracts are used and proper precautions taken, pollen extracts give us one of the most, if not the most, scientific methods of prophylactic treatment known to medicine. The reasons are these: The diagnosis can be made, the exact dose calculated, and the resistance of the patient determined before, during and after the period of treatment. In Ferry's experience 71 per cent, of the cases were relieved of practically all symptoms, and at

least 16 per cent. more were more or less benefited.

Colon Bacillus Infections. The use of colon vaccine in the treatment of prostatitis and other genito-urinary conditions has been favorably reported in the past. Bumpus,²⁴⁸ of the Mayo Clinic, is not favorably impressed with the use of colon vaccine in prostatic cases. He concludes that immunity to pyelonephritis by means or mixed colon bacillus vaccine cannot be produced and that the administration of this vaccine does not markedly reduce the incidence of genito-urinary infection, if it affects it at all. Pre-operative attacks of pyelonephritis are the natural means of producing an immunity to renal infection, and their occurrence makes operative risks less.

The length of convalescence is usually in inverse proportion to the length of pre-operative treatment.

²⁴⁶ Journal of Medical Research, September, 1917.

Interstate Medical Journal, September, 1917.
 Journal of the American Medical Association, January 26, 1918.

Ozena. In a report of his experience with vaccines in the treatment of the various diseases of the nose, throat and ear, Coates²⁴⁹ believes that if properly used little harm can result and they may prove of service. In a number of instances, notably ozena, he offers the suggestion that vaccine therapy alone might solve a problem which has been puzzling clinicians hopelessly for years. Glogau, 250 on the other hand, does not believe in the bacterial origin of ozena. In his opinion the crux in the treatment of what is called ozena lies in the fact that the atrophy of the nasal mucous membrane and its underlying structures is the primary condition and that this atrophy will therefore never be cured by any vaccine treatment whatsoever.

Veratrum Viride. This drug has long had an established place in the treatment of cclampsia. Andrews²⁵¹ states that it will control convulsions, especially antemortem convulsions, at least until other measures for clinical dilatation and delivery can be carried out. He believes it almost a specific for this purpose. With convulsions of any degree of severity, steps looking toward delivery must immediately be instituted. While most of the text-books state that convulsions frequently soften and dilate the cervix, this is not the experience of Andrews.

Edgar²⁵² states that at one time he was an enthusiast in the free employment of veratrum viride in the treatment of eclampsia but that he has changed his views. Although he occasionally uses small repeated doses in selected cases, he avoids the routine use of the drug because he

fears its shock-producing effect.

In a study of the clinical action of veratrum, Collins and Hanzlik²⁵³ found that a slowing of the pulse and fall of blood-pressure occurred with a single therapeutic dose of from 15 to 20 minims of the tineture of veratrum album. Large and repeated doses (25 to 75 minims) produced a slowing of the pulse together with a fall in both systolic and diastolic blood-pressure in practically all individuals studied. The effect produced was roughly proportional to the dose. All the desirable circulatory effects produced by tincture of veratrum album may be secured with doses ranging from 45 to 55 minims, administered at the rate of about 10 to 15 minims every one-half to one hour, and without symptoms of "toxicity." Repeated large doses given at short intervals are apt to give rise to symptoms of toxicity.

Effects in various circulatory disorders were observed about as follows: Most marked in hypertonus; less marked, inconstant or no effect at all in heart block (2 cases); paroxysmal tachycardia, myocarditis with

renal vascular disease, aortic insufficiency (1 case each).

The usual effects of slowing the pulse and fall of both systolic and diastolic blood-pressure were observed in a patient with eclampsia.

The authors used compound tincture of gentian (U.S.P.) under the same conditions as tineture of veratrum album in the same and other

²⁵⁰ Laryngoscope, May, 1918. ²⁵¹ Memphis Medical Journal, December, 1917.

²⁴⁹ Journal of the American Medical Association, 1917.

Memphis Medical Journal, December, 1947.

252 Journal of the American Medical Association, April 27, 1918. 253 Journal of Pharmacology and Experimental Therapeutics, February, 1918.

individuals, but no noteworthy effects on the circulation were demonstrable. The effects of veratrum are due, therefore, to the drug per se.

Veronal. In calling attention to the indiscriminate use of veronal on the part of the laity and the not infrequent cases of poisoning resulting from its use the British Medical Journal (February 9, 1918), quotes the following official notice of the Home Office to the public: "There have been many cases of veronal poisoning in this country, and it is desirable that it should be known that the drug cannot safely be used except on the advice of a practitioner on each occasion. Many persons are specially susceptible to the action, and fatal poisoning may occur even from small doses of the drug, especially if repeated. The danger is still greater when doses are progressively increased. It is most important, therefore, that veronal and its derivatives and allied substances should only be taken with the knowledge and consent of a medical practitioner, and on his written prescription; and it is advisable that the dispensing of such prescriptions should not be repeated without the written sanction of the medical man."

X-rays. In considering the possibilities and limitation of roentgen therapy in *malignant disease*, Pfahler²⁵⁴ believes that it is possible to cure the majority of cases of superficial malignant disease by the x-rays and it is possible, he believes, to cure all cases of this nature by a combination of electrocoagulation and roentgen therapy if applied before metastasis has taken place and deep tissues are involved. Their combined treatment should be used wherever the end-results will be improved, and this will apply in the majority of cases. There should be a combination of either electrocoagulation and roentgen therapy or operation and electrotherapy.

In the great majority of cases when the malignant disease has extended to the glands, to the bowels or the internal organs from the breast, for example, or the uterus, the patient cannot be cured by the x-rays. The patient can, however, be greatly benefited even in these advanced cases. With proper technic, Pfahler states that the rays can be expected to cure the majority of cases of sarcoma, the most responsive to the treatment being medullary bone cases, the sarcomas involving the soft tissues,

and least of all the periosteal sarcomas.

A clinical and experimental study of the value of roentgen rays and radium in malignant disease has been made by Levin and Levine. They believe that it is advisable to radiate malignant tumors not only after operation, but in certain cases also before an operation so as to sterilize and inhibit the proliferation of those cancer cells which may be left behind or transplanted elsewhere in the course of an operation. The authors state that the fear expressed by some clinicians that the raying may occasionally irritate and increase the rate of growth of the tumor is unfounded. The result of such treatment is always an inhibition.

In a series of 20 cases of carcinoma of the rectum the following observation was made. In the cases in which an attempt at a radical operation was made, the condition recurred with greater rapidity and malig-

 ²⁵⁴ Journal of American Medical Association, September 22, 1917.
 ²⁵⁵ Annals of Surgery, April, 1918.

nancy than in those cases in which there was no operation done and only radium and x-ray treatment given or an exploratory operation was done followed by radiations. In this series of cases the malignant recrudescence of the disease was not caused by the operative interference, but accidentally took place after the operation. The same holds true of the recrudescences which occasionally may take place after radium or x-ray treatment, thus preoperative and postoperative radiations of cancer as a method of inhibiting the proliferating power and the consequent clinical malignancy of the tumor cells is of undoubted value and presents no danger.

In a comparison of the roentgen rays and radium in the treatment of uterine hemorrhage, Corscaden²⁵⁶ states that radium is preferable in practically all cases except younger women, in whom small repeated doses may be desirable. Although the actual amount of time consumed in treatment is about the same in both, that devoted to the roentgen rays is spread over from six to ten weeks, while the radium is finished in

twenty-four hours.

Uterine hemorrhage from almost any cause may be stopped by the intra-uterine application of radium; the hemorrhage from disturbed menstruation with or without fibromyoma may be controlled by the roentgen rays. Also practically all fibromyomas will shrink to a satisfactory degree after roentgen therapy. Practically no harm results from roentgen therapy in these cases. All cases of hemorrhage from a grossly normal uterus in women of thirty-eight years or over should be treated by the x-rays after carcinoma has been ruled out. In younger women Corscaden believes roentgen therapy should be used as a last resort. In cases of uterine hemorrhage associated with fibromyoma of the uterus, roentgen therapy is the proper treatment, if symptoms from mechanical causes are absent and the woman is thirty-eight years or

Pfahler and McGlinn²⁵⁷ report an interesting case in which successful dissipation of a uterine fibroid was achieved, by means of the roentgen rays with, at the same time, protection of the ovaries. The proof that they were successful is furnished by the fact that the woman subsequently became pregnant. The successful treatment of such a case demands (1) a careful and thorough investigation on the part of the gynecologist as to the size and position of the tumor; (2) he should report, so far as possible, on the condition and position of the ovaries. (3) The roentgenologist should be most careful in his technic as to the direction of the rays and as to the protection of the skin of the patient and the protection of the ovarian region. The skin must be properly protected, for, if operation is needed later, it should not be damaged.

A series of 19 cases of hyperplasia of the thymus treated by x-rays is reported by Benjamin.²⁵⁸ The interval between treatments was usually one week unless the urgency of the symptoms suggested more

²⁵⁶ American Journal of Obstetrics and Diseases of Women and Children, February, 1918. 257 Ibid., August, 1917.

²⁵⁸ Archives of Pediatrics, February, 1918.

frequent applications. The treatment has proved entirely harmless in young children and if the symptoms are urgent may be repeated in a day or so. Benjamin believes that the failure to administer full doses and repeat them promptly, if the symptoms are urgent, has led to fatalities. To guard against sudden deaths before the full destructive effect of the roentgen rays upon the thymus gland has been elicited, all cases with urgent symptoms should be kept under close observation and the x-ray treatments should be pushed boldly.

Verning²⁵⁹ reports 2 cases in which the vascular, recently developed goitre was given roentgen treatment and fatal thyroidism followed. The dosage of the rays was not above the average, but must have been

excessive, Verning thinks, for such recently developed cases.

In an analysis of similar cases which he found on record with aggravation of the symptoms the condition was, as a rule, transient, and the

result on the whole was improvement.

Hazen²⁶⁰ states that the use of the roentgen rays in *acne vulgaris* is justified as a routine procedure by those who are absolutely certain of their roentgen-ray technic, and by no others, since much damage can easily be done by an inexperienced operator. In his opinion this method affords much the quickest and surest way of controlling the disease.

Yeast. A study of the effect of bakers' yeast in diseases of the skin and of the gastro-intestinal tract has been made by Hawk, Knowles, Rehfuss and Clarke. In all their tests they used Fleischmann's Compound Yeast, being the best known and the most widely used of bakers' yeast. The amount administered varied from one-quarter of a cake to three cakes daily after meals. In all, 91 cases were studied.

So far as gastro-intestinal conditions are concerned, it is apparent, from their results, that yeast has its greatest usefulness in conditions accompanied by cutaneous manifestations. In their opinion the yeast is essentially indicated in chronic non-obstructive bowel conditions and

contraindicated in the acute conditions.

It was found to be a useful remedy, and fully as successful as any other remedy, in the treatment of furunculosis, acne vulgaris and acne rosacea. The conditions which responded most favorably were furunculosis, the acnes (vulgaris and rosacea) and constipation. Of 17 cases of furunculosis, all but 1 were improved or cured. Of 17 cases of acne vulgaris, all were improved or cured. Of 10 cases of constipation, 9 were improved or cured. In other words 50 out of 52 cases of furunculosis, the acnes and constipation were improved or cured by the yeast treatment.

Zinc. In the treatment of *crysipelas*, Milliken²⁶² suggests the following procedure: Rest in bed is enforced. At the start calomel and salts are given and diet allowed according to the patient's appetite. Fluids are given freely during the febrile period and sedatives or stimulants given as required. If ichthyol has been previously applied, it is removed as

Mospitalstidende, August 1, 1917; Journal of the American Medical Association.
 October 20, 1917.
 Ibid., September 22, 1917.

Journal of the American Medical Association, October 13, 1917.
262 Annals of Surgery, August, 1917.

ZINC 405

thoroughly as possible. The entire region attacked by the disease is thickly dusted with powdered stearate of zinc which is reapplied as it falls or is brushed off. If a wound is present it is treated as a similar wound would be in the absence of erysipelas. The face of a patient with abscess in the eyelids is powdered freely and the eyes kept moist with small compresses renewed from a basin of cold boric acid solution. A drop or two of 20 per cent. argyrol is placed in the conjunctive from two to five times in the twenty-four hours.

In leg cases if periphlebitis or cellulitis develops, an incision is made as soon as fluctuation appears and then wet dressings of boric acid or

magnesium sulphate or dilute alcohol are applied.



INDEX.

A	Aneurysm, treatment of, by proxima occlusion by an autoplastic flap, 253
Abortion, incomplete, pituitary extract	Aneurysms, bone, 306
in, 364	Angina, Vincent's, 19
Achylia gastrica, 48	Antacids, effects of, in stomach, [34]
and tissue lientery, 51	Antimony 218
diarrhea accompanying, 52	Antimony, 318
treatment of, 50 Acidity, gastric, 25	Antiseptic, iodine as, 349 Appendicitis, 111
effect of pancreatic secretion on,	acute, 111
observations on, after gastro-	and oxyuriasis, 111 Arsenate of sodium in soft chancres, 320
enterostomy, 69	Arsenic, 319
by gas chain method, 25	Arsenic-content in cerebrospinal fluid
reduction of, 37	after arsphenamin injections, 320
total, respecting, after gastro-enteros-	Arsphenamin, 320
tomy, 69	in pyorrhea, 321
Acidosis in surgery, 224	Arthroplasty for new joint formation, 257
Acne, yeast in, 404	Artificial heliotherapy, 347
Acriflavine in wound infections, 243	Ascaris infection, oil of chenopodium in
Addison's disease, adrenalin in, 315	328
Adrenal dyspepsia, 48	Ascites, 130
Adrenalin, 315	a study of cases in China, 130
in cholera, 316	Aspirin, 321
effect of, on muscular fatigue, 316	poisoning, chronic, 321
in hemorrhage, 316	Asthma, proteins in, 368
in hyperchlorhydria, 316	vaccines in, 400
in hyperthyroidism, 316	Atony, dilatation of stomach from, 42
in sea sickness, 316	Atropine, 321
Albuminurias, long-standing, causation	effect of, in stomach, 35
and curability of, 153	in pulmonary hemorrhage, 321
Alcohol, 316	Auricular fibrillation, camphor in, 325
benzyl, 323	digitalis in, 334
as local anesthetic, 323	Auto-intoxication in chronic constipa-
wood, poisoning, 318	tion, 106
Amblyopia, quinine, 374	,
Ambulance, field, 218	В
Amebiasis, 89	
chronic enteritis in, 91	Balantidium coli in Argentine, 96
treatment of, 91	Balsam of Peru, 321
emetine in, 91	in scabies, 321
emetine-bismuth iodide in, 91	Beef serum in treatment of anthrax, 380
salvarsan in, 91	of wounds, 381
Amebic dysentery, 89	Bence-Jones proteinuria in hypertension
distribution of, 95	151
Amenorrhea, thyroid extract in, 392	Benign bone tumors, 277
Amyl nitrite, 359	Benzol, 322
in mitral stenosis, 359	in leukemia, 322
Anaphylatoxin, 394	Benzyl alcohol, 323
Anaphylaxis, 394	as local anesthetic, 323
Anemia, iron in, 351	Bilharzia, 249
pernicious, fractional test-meal in, 31	hematuria, emetine in, 344
Anesthesia in war, 228	Biliary passages, causes of recurrence
Anesthetic, local, benzyl alcohol as, 323	after operation on, 128

Bismuth, 323 Chloramin-T, 330 in chronic hyperacidity, 323 in wound infections, 243 Bladder, diseases of, 173 Chlorazene, 330 diverticula of, 175 exstrophy of, 173 in diphtheria carriers, 330 Chlorine, 330 in diarrhea in infants, 330 gunshot wounds of, 183 syphilis of, 180 Cholera, adrenalin in, 316 tumors of, 177 Chronic diarrhea, 97 rectal and sigmoid conditions treatment of, by radium, 177 in, 97 Bleeding, coagulose in, 391 Blood lipoids in nephritis, 151 Coagulose in bleeding, 391 occult, in stools in pulmonary tuberin hemophilia, 391 in melena neonatorum, 391 culosis, 80 plasma and kidneys, 135 Cod-liver oil, 331 in rickets, 331 Bloodvessels, wounds of, 252 Bone and tendon-sheath, giant-cell Colitis, chronic, 86 growth of, 291 mucous, fecal analysis in, 82 aneurysms, 306 cysts, benign, 280 Colon bacillus infections, vaccines in, 400 pelvic, cancer of rectum and, 98 malignant, 306 spastic contractions of, magnesium sulphate in, 87 lesions, marrow, 303 stasis, 109 medullary, 303 tumors, 276 Constipation, 86, 102 chronic, auto-intoxication in, 106 benign, 277 malignant, 293 enterocolonic conditions in, 103 Bowel, paralysis of, pituitary extract in, rectal conditions in, 107 habitual, 86. 366 Brain tumor, chronic nephritis simulatrectal, 87 spastic, 102 ing, 158 Bromoform, 323 Corpus luteum, 332 Creatinin, uric acid, urea and, 144 in whooping-cough, 323 Bronchitis, eucalyptol in, 346 Cysts, bone, appearing as multiple cystic hexamethylenamine in, 348 lesion, 287 benign, 280 Burns, 241 of clavicle, 286 paraffin wax treatment of, 241 healing without operation in, 282 C indications for operation in, 282 Calcium carbonate, 324 huge, 285 large, operative treatment of, in gastric hyperacidity, 324 Calculi, prostatic, 195 malignant, 306 Camphor, 324 multiple, 287 in auricular fibrillation, 325 of prostate, 195 in chronic myocarditis, 324 in valvular lesions, 325 Cancer, gastric, 53 D early diagnosis of, 53 results of operations on, 54 Dakin's solution in wound infections, 243 of rectum and pelvic colon, 98 Carcinoma, emetine in, 344 Delirium tremens, digitalis in, 340 Diabetes insipidus, pituitary extract in, gastric, fractional test-meal in, 31 364 Cardiospasm dilator, 23 Casualty clearing station, 219 pancreatic, 117 Catheterization of ejaculatory ducts, 203 Diarrhea accompanying achylia gastrica, Cecum, palpation of, 85 Chancres, soft, sodium arsenate in, 320 Chancroid, 199 chronic, rectal and sigmoid conditions in, 97 silver in, 389 treatment of, 201 Chaulmoogra oil, 325 enterocolonic, surgical treatment of, in leprosy, 325 85 of fermentation, fecal analysis in, 82 Chenopodium, 326 in hookworm infection, 326 in infants, chlorine in, 330 oil of, in ascaris infection, 328 Diathermy in treatment of gastric ulcer, 72 poisoning from, 329 treatment of, 329 Diet, balanced, analyzed, 33 Children, renal functional tests in, 150 in intestinal toxemia, 104

Enterocolitis, parasitic forms of, fecal analysis in, 82

Epididymis, syphilis of, 208

meal in, 30

diseases of, 118

etiology of, 118

Gall-stones, 118

Epinephrin, 315

in Addison's disease, 315 enterostomy, 68 Epithelial tumors of lower extremity, 270 tract, action of opium on, 39 of upper extremity, 268 Digitalis, 333 Erysipelas, zinc in, 404 in auricular fibrillation, 334 Esophagus, dilatation of, 24 in delirium tremens, 340 effect of, on blood-pressure, 338 diseases of, 23 Ethylhydrocuprein, 345 in heart disease, 334 in pneumonia, 345 method of dosage, 336 Eucalyptol, 346 in bronchitis, 346 in valvular heart disease, 335 Dilatation of esophagus, 24 of stomach from atony, 42 poisoning by, 346 Dilator, cardiospasm, 23 Euglobulin in tuberculous hemoptysis, Diphtheria carriers, chlorazene in, 330 Eupad in wound infections, 242 serum treatment of, 381 Eusol in wound infections, 242 Diverticula of bladder, 175 Exophthalmic goitre, quinine in, 373 Ducts, ejaculatory, catheterization of, 203 rest in, 378 Duodenal contents, method of obtaining, Exostosis, 276 120 bursata, 276 urobilin and urobilinogen in, 119 simulating sarcoma, 277 ulcer, 74 Exstrophy of bladder, 173 diagnosis of, 74 Extract, ovarian, 332 duodenal alimentation in treatof parathyroid gland, 361 ment of, 74 treatment of, 75 in paralysis agitans, 361 Duodeno-urethral fistula, spontaneous, Duodenum, diseases of, 72 ulcer of, healing of, 62 Fatigue, muscular, adrenalin in, 316 perforations of, 60 Fecal analysis in chronic enteritis, 81 Dysentery, amebic, 89 signs of gastric insufficiency, 111 distribution of, 95 emetine in, 340 of liver disease, 128 Feeding after gastro-enterostomy, immeand silver nitrate in, 95 bacillary, 95 diate jejunal, 66 rectal, 115 Dyspepsia, adrenal, 48 Feet, shoes and care of, 261 syndromes of, 45 Fever, changes produced in gastric secretion by, 41 Fevers, acute, renal function following, E 149 Field ambulance, 218 Fistula, duodeno-ureteral, spontaneous, Echinococcus cyst of liver perforating into pleura, 129 Flavine in wound infections, 243 Edema, salicylate, 379 Foods, gastric response to, 27 Elephantiasis, 250 hot, as a factor in digestive disturb-Kondeleon operation in, 250 ances, 25 Emetine, 340 Fractional test-meal, 30 Fracture stretcher for suspension and in amebiasis, 91 in amebic dysentery, 340 traction under x-ray control, 259 in bilharzia hematuria, 344 Fractures, treatment of, by extension and in carcinoma, 344 toxic effects of, 344 traction, 259 in war, 257 Emetine-bismuth iodide, 342 Furunculosis, yeast in, 404 in amebiasis, 91 in entameba histolytica carriers, 94 G Emotional influences in gastro-intestinal diseases, 27 Entameba histolytica carriers treated GALL-BLADDER disease, fractional test-

Diet in nephritis, 152

factor in, 25

Digestive disturbances, hot foods as a

with emetine-bismuth iodide, 94

Enteritis, chronic, in amebiasis, 91

fecal analysis in, 81

vaccine therapy in, 77

malfunction, signs of, after gastro-

Gangrene, gas, 245 H color changes in skin in, 246 conservative treatment of early, HAY fever, pituitary extract in, 367 vaccines in, 400 method of spread of, into living Heart block, alpha-iodine in, 350 Heliotherapy, 346 artificial, 347 tissue, 246 recurrence of, after amputation, in lupus, 347 in surgical tuberculosis, 346 treatment of, by mixed serum, in tuberculous children, 347 vesical, caused by anaërobic bacilli, joints, 347 185 in wounds, 347 Gas gangrene, 245 Hematoma, perirenal, 169 Gastric acidity, 25 Hematuria, bilharzia, emetine in, 344 effect of on, 118 of Hemolytic jaundice, 123 pancreatic secretion Hemophilia, coagulose in, 391 Hemoptysis, tuberculous, euglobulin in, observations on, after gastroenterostomy, 69 391 by gas chain method, 25 thromboplastin in, 391 reduction of, 37 Hemorrhage, adrenalin in, 316 affections, method of treatment for, postpartum, pituitary extract in, 362 pulmonary, atropine in, 321 cancer, 53 turpentine in, 396 disturbances, oxygen treatment for, uterine, x-rays in, 403 Hepatic troubles, fecal analysis in, 81 function following gastro-enteros-Hexamethylenamin, 348 tomy, 67 in acute infectious diseases, 348 insufficiency, fecal signs of, 111 in bronchitis, 348 lipase, 25 toxic action of, 348 muscle activity, 37 Hookworm in Brazilian navy, 96 oil of chenopodium in, 326 response to foods, 27 Hospital ships, 214
Hospitals of American Expeditionary
Force, 221
special, 220 secretion, changes produced in, by fever, 41 study, 41 syphilis, 56 troubles of intestinal origin, 76 Hydrochloric acid, 348 ulcer, diathermy in treatment of, 72 in neuritis, 348 healing of, 62 in sciatica, 348 Gastritis, primary phlegmonous, 55 Hyoscine, 349 Gastro-enteritis, fecal analysis in, 83 as hypnotic, 349 Gastro-enterostomy, 65 Hyperacidity, chronic, bismuth in, 323 after-results, 66 gastric, calcium carbonate in, 324 gastric function following, 67 Hyperchlorhydria, adrenalin in, 316 immediate jejunal feeding after, 66 from biliary troubles, 125 observations on gastric acidity after, Hyperthyroidism, adrenalin in, 316 69 Hypertrophy of prostate, 187 postoperative symptoms in patients not dyspepsia-free, 68 respecting total acidity after, 70 roentgen examination after, 72 signs of digestive malfunction after, ICTEROHEMORRHAGIC spirochetosis, 125 68 Idiosyncrasy to quinine, 373 test-meal observations after, 69 Ileocecal valve, incompetency of, versus Gastro-intestinal diseases, emotional in-Lane's kink as cause of ileac stasis, 99 fluences in, 27 Gastroptosis, 54 Ileus, 116 adynamic, 116 treatment of, 55 treatment of, 116 Genital organs, external, diseases of, 199 dynamic, 117 Giant-cell growth of bone and tendonmechanical, 117 sheath, 291 tumors, 290 Incompetency of ileocecal valve versus Lane's kink as cause of ileac stasis, 99 Infections of mouth, 18 wound, 242 Goitre, exophthalmic, quinine in, 373 rest in, 378 iodine in, 350 acriflavine in, 243 Gonorrheal complement-fixation test, 206 chloramine-T in, 243 Gunshot wounds of bladder, 183 Dakin's solution in, 243 of kidneys, 159 eupad in, 242

Infections, wound, eusol in, 242 flavine in, 243 lymph lavage in, 242 Injuries, joint, 254 nerve, 250 peripheral, mechanical ment of, 250 treat-Intestinal stasis, 109 toxemia, 104, 108 chronic, 108 diet in, 104
Intestine, small, inflammation of, fecal analysis in, 81 Intestines, action of opium on, 40 benign tumors of, 83 effect of pituitrin on, 366 large and small, diseases of, 76 Intramuscular injections of quinine, 372 Intravenous injection of quinine, 370 Iodide of potassium, 367 intravenous use of, 367 Iodine, 349 alpha, 350 in heart block, 350 as antiseptic, 349 goitre, 350 in tuberculosis, 350 Iron, 351 in anemia, 351 Ischuria, pituitary extract in, 366

J

Jaundice, spirochetal, 125
hemolytic, 123
infectious, wild rats as carriers of
spirochete of, 129
Joint formations, new arthroplasty for,
257
injuries, 254
Joints, tuberculous, heliotherapy in, 347

ĸ

Kala-azar, tartar emetic in, 318
Keratodermia blenorrhagica, 204
Kidney, tuberculosis of, 162
Kidneys, blood plasma and, 135
diseases of, 135, 159
function of, in acute nephritis, 149
following acute fevers, 149
in senility, 150
tests of, 142
in children, 150
gunshot wounds of, 159

L

Lactic acid bacilli, 351
in leucorrhea, 351
in colicky babies, 353
in vulvovaginitis in children, 352
Lavage, transduodenal, 72
indications for, 72

Lavage, transduodenal, technic of, 72
Leishmaniosis, tartar emetic in, 318
Leprosy, chaulmoogra oil in, 325
Leucorrhea, lactic acid bacilli in, 351
Leukemia, benzol in, 322
myelogenous, radium in, 377
Lientery, tissue, achylia gastrica and, 51
Lipase, gastric, 25
Liver disease, fecal signs of, 128
diseases of, 118
echinococcus cyst of, perforating
into pleura, 129
Locke's serum in shock, 227
Lupus, heliotherapy in, 347
Lymph lavage in wound infections, 242

M

Magnesium sulphate in spastic contractions of colon, 87 Malaria, quinine tannate in, 369 tartar emetic in, 319 Malignant disease, x-rays in, 403 Marasmus, horse serum in treatment of, Marrow-bone lesions, 303 Medical versus surgical treatment of peptic ulcer, 58 Medullary bone lesions, 303 sarcoma, 304 Melena neonatorum, coagulose in, 391 Meningism due to serum disease, 384 Meningitis, serum treatment of, 383 Mercury, 353 idiosyncrasy to, 355 inunctions in pruritus, 357 poisoning by, 353 in pruritus ani, 356 Migraine and intestinal stasis, 110 Military orthopedics, 260 Mineral oil, 357 Mitral stenosis, amyl nitrite in, 359 Morphine, effects of, on digestive tract, 359 hibitués, treatment of, 360 Mouth, diseases of, 18 infections of, 18 Muscular fatigue, adrenalin in, 316 Mustard, oil of, 358 Musterole, 358 poisoning, 358 Myocarditis, chronic, camphor in, 324 Myositis, ossifying, 295 Myrtol in bronchitis, 346 poisoning by, 346 Myxochondrosarcoma, 310

N

Naval surgery, 213
Nephritis, acute, renal function in, 149
blood lipoids in, 151
chronic, clinical classification of, 156

Nephritis, chronic, etiologic diagnosis of, and hypertensive vascular degeneration, 154 simulating brain tumor, 156 diet in, 152 diureties in, 157 functional and anatomical findings in, 151 war, 137
Nerve injuries, 250 transplantation, 251
Neuritis, hydrochloric acid in, 348
Nitrite of amyl, 359 in mitral stenosis, 359

0

Olive oil, 359 Operations for undescended testicle, 207 Opium, 359 action of, on digestive tract, 39 on intestines, 40 on stomach, 39 effects of, on digestive tract, 359 Optochin, 345 in pneumonia, 345 Orthopedics, military, 260 Osteomyelitis, pyogenic, 303 syphilitic, 303 treatment of, secondary to compound fracture, 258 tuberculous, of shaft, 303 Ovarian extract, 332 Oxygen treatment for gastric disturbances, 72 Oxyuriasis, appendicitis and, 111 Ozena, vaccines in, 401

P

Palpation of cecum. 85 Pancreas, diseases of, 117 Pancreatic secretion, 117 diabetes, 117 effect of, on gastric acidity, 118 troubles, fecal analysis in, 81 Pancreatitis, acute, 118 Paralysis agitans, parathyroid gland extract in, 361 Parathyroid gland extract, 361 in paralysis agitans, 361 Paresis, mercury inunctions in, 357 Perforations of gastric and duodenal ulcer, 60 Periosteal giant-cell sarcoma, 299 sarcoma, 299 Periostitis, syphilitic, 297 traumatic ossifying, 297 Perirenal hematoma, 169 Peristalsis, reverse, 42 Peritoneum, 130 Peritonitis, pneumococcic, 133 tuberculous, 132 Phenolsulphonephthalein test of renal function, 147

Phosphorus, 361 in rickets, 362 Pituitary extract, 362 before tonsillectomy, 362 in diabetes insipidus, 364 effect of, on daily output of urine, 366 on intestines, 366 in hay fever, 367 in incomplete abortion, 364 in ischuria, 366 in paralysis of bowel, 366 in postpartum hemorrhage, 362 Placental, extract, 367 Pneumococcic peritonitis, 133 Pneumonia, ethylhydrocuprein in, 345 postoperative, 231 serum treatment of, 387 asthma complicating, 389 Poisoning, acute mercuric chloride, transfusion in, 154 Poliomyelitis, serum treatment of, 382 Potassium iodide, 367 intravenous use of, 367 Preoperative treatment, 229 Proliferation of gastric membrane following ingestion of wool-fat, 57 Prostate, calculi of, 195 cysts of, 195 diseases of, 187 hypertrophy of, 187 Prostatectomy, advisability of, in presence of spinal cord lesions, 190 end-results after, 190 suprapubic, secondary closure of vesical wound after, 193 Proteins, 368 in asthma, 368 Proteinuria, Bence-Jones, in hypertension, 151 Pruritus ani, mercury in, 356 Pseudo prostatism of alcoholic origin, 198

Q

Pyelitis, non-surgical, chronic, 167

Pyorrhea, arsphenamin in, 321

Quinine, 369
amblyopia, 374
in exophthalmic goitre, 373
idiosyncrasy to, 373
intramuscular injections of, 372
intravenously, 370
prophylactic use of, 373
tannate in malaria, 369
Quinoformol solution in war surgery, 240

R

Radium, 375
action of, on hematopoietic system,
378
and x-rays in treatment of tumors,
274
in malignant disease, 375

INDEXShock, treatment of, Locke's serum in, 227 Radium in myelogenous leukemia, 377 in war wounds, 224 in treatment of vesical tumors, 177 Shoes and care of feet, 261 Rats, wild, as carriers of spirochete of Sigmoiditis, fecal analysis in, 82 infectious jaundice, 129 Silver, 389 Reconstruction, 262 in chronic diarrhea, 389 Rectal conditions in chronic constipation, Skin, sarcoma of, 274 107 Sodium arsenate in soft chancres, 320 feeding, 115 bicarbonate, effect of, in stomach, 35 Rectum, cancer of, and pelvic colon, 98 Regimental aid posts and treatment of chloride excretion, 148 versus potassium, 389 wounded in zone of action, 218 Special hospitals, 220 Renal function in acute nephritis, 149 Spirochetal jaundice, 125 following acute fevers, 149. Spirochetosis, icterohemorrhagic, 125 in senility, 150 tests of, 142 Stasis, colon, 109 in children, 150 intestinal, 109 migraine and, 110 insufficiency in urticaria, 157 Stomach, action of opium on, 39 test-meals, 146 diagnosis, rapid, 41 dilatation of, from atony, 42 Rest, 378 in exophthalmic goitre, 378 diseases of, 25 in tuberculosis, 379 effects of antacids in, 34 Reverse peristalsis, 42 Rheumatic fever, acute, salicylates in, 379 syphilis of, 56 tuberculosis of, 57 Rickets, phosphorus in, 362 ulcer of, medical versus surgical treat-Roentgen examination after gastroment, of, 58 enterostomy, 69 perforations of, 60 Storax in scabies in children, 322 Strophanthus, 390 S in cardiac failure, 390 Surgery, acidosis in, 224 Salicin, 379 Syndromes of dyspepsia, 45 Syphilis of bladder, 180 of epididymis, 208 Salicylates, 379 Salvarsan in amebiasis, 91 effects of, adrenalin to relieve disof stomach, 56 agreeable, 315 Syphilitic osteomyelitis, 303 Sarcoma, giant-cell, periosteal, 299 medullary, 304 periosteal, 299 periostitis, 297 ossifying, 301 T of skin, 274 of soft parts, 274 Scabies, balsam of Peru in, 321 Tapeworm in Argentine, 96 Tartar emetic, 318 in children, storax in, 322 in kala-azar, 318 Scarlet fever, serum treatment of, 386 in leishmaniosis, 318 Sciatica, hydrochloric acid in, 348 Sea sickness, adrenalin in, 316 in malaria, 319 Secretion, pancreatic, 117

effect of, on gastric acidity, 118

Serum beef, in treatment of anthrax, 380

of wounds, 381

Senility, renal function in, 150

of anthrax, 380 of diphtheria, 381

of marasmus, 387

of meningitis, 383

of pneumonia, 387

of poliomyelitis, 382

of scarlet fever, 386

postoperative hemorrhage and car-

of tetanus, 385

diac dilatation, 227

transfusion in, 393

treatment of, 225

treatment, 380

Ships, hospital, 214 Shock, 223

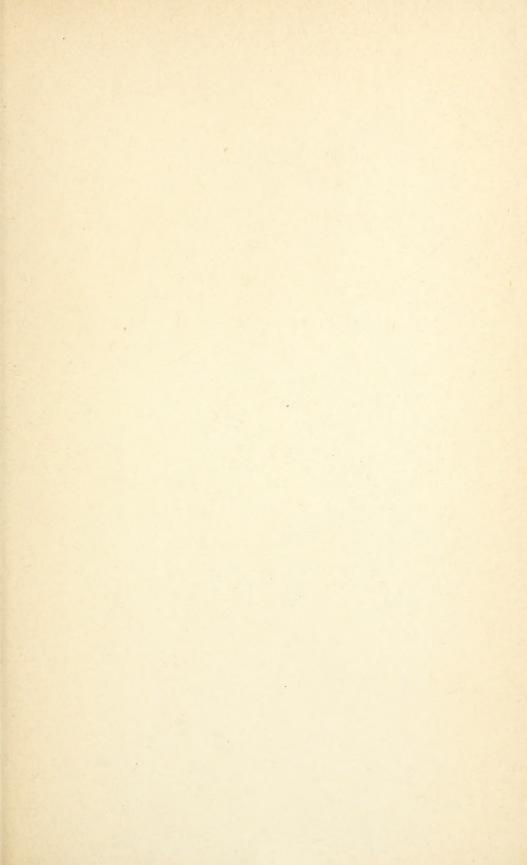
etiology of, 223

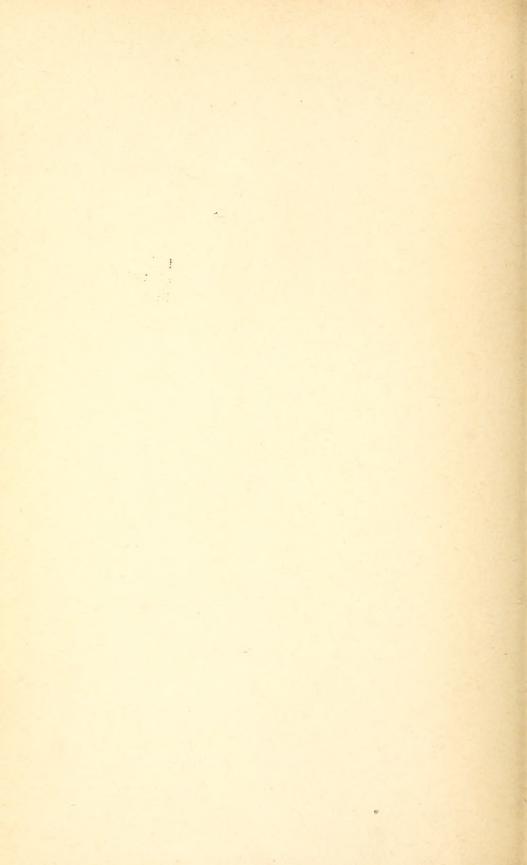
Test, gonorrheal complement-fixation, 206 Test-meal, fractional, 30 in duodenal ulcer, 31 in gall-bladder disease, 30 in gastric carcinoma, 31 ulcer, 31 in pernicious anemia, 31 observations after gastro-enterostomy, 69 Test-meals, renal, 146 Testicle, undescended, operations for, 207 Tests of renal function, 142 Tetanus, 248 serum treatment of, 385 Theocin, 391 as diuretic, 391 Thromboplastin, 391 in tuberculous hemoptysis, 391 Thymus, hyperplasia of, x-rays in, 403 Thyroid extract, 392 in amenorrhea, 392

	TNDEA		
Thyroid extract in uterine bleeding, 392 Tonsillectomy, pituitary extract before, 367 Toxemia, intestinal, chronic, 108 diet in, 104 Transduodenal lavage, 72 indications for, 72 technic of, 72 Transfusion, 392 in acute mercuric chloride poisoning, 154 in shock, 393 Traumatic ossifying periostitis, 297 Tuberculoin, 395 in tuberculosis, 395 Tuberculosis, iodine in, 350 of kidney, 162 rest in, 379 of stomach, 57 surgical, heliotherapy in, 346 tuberculin in, 395 Tuberculous peritonitis, 132 Tumor, brain, chronic nephritis simulating, 158 Tumors, 266 of bladder, 177 bone, 276 benign, 277 malignant, 293 epithelial, of lower extremity, 270 of upper extremity, 268 giant-cell, 290 of intestines, benign, 83 radium and x-ray in treatment of, 274 Turpentine, 396 in hemorrhage, 396 Typhlitis, chronic, fecal analysis in, 81 Tyramin hydrochloride, 396	Vaccines in arthritis, 397 in asthma, 400 in colon bacillus infections, 400 combined vaccination with, 79 in hay fever, 400 in ozena, 401 typhoid, 397 in whooping cough, 399 Valvular heart disease, digitalis in, 335 lesions, camphor in, 325 Veratrum viride, 401 in eclampsia, 401 Veronal, 402 Vesical diverticula, 175 gangrene caused by anaërobic bacilli, 185 syphilis, 180 tumors, 177 Vincent's angina, 19 blood in, 21 diagnosis of, 22 duration of, 21 exciting cause of, 20 symptoms of, 21 treatment of, 22 Vulvovaginitis in children, lactic acid bacilli in, 352 W WAR, anesthesia in, 228 fractures in, 257 literature, 215 nephritis, 137 Whooping cough, bromoform in, 323 vaccines in, 399 Wound infections, 242 treatment, 233 Wounds, beef serum in treatment of, 381 of bladder, gunshot, 183		
Ulcer, duodenal, 74 diagnosis of, 74 duodenal alimentation in treatment of, 74 fractional test-meal in, 30 healing of, 62 perforations of, 60 treatment of, 75 gastric, diathermy in treatment of, 72 fractional test-meal in, 31 healing of, 62 perforations of, 60 peptic, medical versus surgical treatment of, 58 Ulceration, intestinal, fecal analysis in, 82 Urethra, diseases of, 199 Uric acid, urea and creatinin, 144	of bloodvessels, 252 gunshot, excision and suture of, under local anesthesia, 237 heliotherapy in, 347 of kidney, gunshot, 159 war, shock in, 224 X X-RAYS, 402 in army, 220 in hyperplasia of thymus, 403 in malignant disease, 402 radium and, in treatment of tumors, 274 in uterine hemorrhage, 403		
Ulcer, duodenal, 74 diagnosis of, 74 duodenal alimentation in treatment of, 74 fractional test-meal in, 30 healing of, 62 perforations of, 60 treatment of, 75 gastric, diathermy in treatment of, 72 fractional test-meal in, 31 healing of, 62 perforations of, 60 peptic, medical versus surgical treatment of, 58 Ulceration, intestinal, fecal analysis in, 82 Urethra, diseases of, 199 Uric acid, urea and creatinin, 144 Urine, effect of pituitrin on, 366	gunshot, excision and suture of, under local anesthesia, 237 heliotherapy in, 347 of kidney, gunshot, 159 war, shock in, 224 X X-RAYS, 402 in army, 220 in hyperplasia of thymus, 403 in malignant disease, 402 radium and, in treatment of tumors, 274		
Ulcer, duodenal, 74 diagnosis of, 74 duodenal alimentation in treatment of, 74 fractional test-meal in, 30 healing of, 62 perforations of, 60 treatment of, 75 gastric, diathermy in treatment of, 72 fractional test-meal in, 31 healing of, 62 perforations of, 60 peptic, medical versus surgical treatment of, 58 Ulceration, intestinal, fecal analysis in, 82 Urethra, diseases of, 199 Uric acid, urea and creatinin, 144 Urine, effect of pituitrin on, 366	gunshot, excision and suture of, under local anesthesia, 237 heliotherapy in, 347 of kidney, gunshot, 159 war, shock in, 224 X X-RAYS, 402 in army, 220 in hyperplasia of thymus, 403 in malignant disease, 402 radium and, in treatment of tumors, 274 in uterine hemorrhage, 403		
Ulcer, duodenal, 74 diagnosis of, 74 duodenal alimentation in treatment of, 74 fractional test-meal in, 30 healing of, 62 perforations of, 60 treatment of, 75 gastric, diathermy in treatment of, 72 fractional test-meal in, 31 healing of, 62 perforations of, 60 peptic, medical versus surgical treatment of, 58 Ulceration, intestinal, fecal analysis in, 82 Urethra, diseases of, 199 Uric acid, urea and creatinin, 144 Urine, effect of pituitrin on, 366 Urobilin and urobilinogen in duodenal	gunshot, excision and suture of, under local anesthesia, 237 heliotherapy in, 347 of kidney, gunshot, 159 war, shock in, 224 X X-rays, 402 in army, 220 in hyperplasia of thymus, 403 in malignant disease, 402 radium and, in treatment of tumors, 274 in uterine hemorrhage, 403 Y YEAST, 404		
Ulcer, duodenal, 74 diagnosis of, 74 duodenal alimentation in treatment of, 74 fractional test-meal in, 30 healing of, 62 perforations of, 60 treatment of, 75 gastric, diathermy in treatment of, 72 fractional test-meal in, 31 healing of, 62 perforations of, 60 peptic, medical versus surgical treatment of, 58 Ulceration, intestinal, fecal analysis in, 82 Urethra, diseases of, 199 Uric acid, urea and creatinin, 144 Urine, effect of pituitrin on, 366 Urobilin and urobilinogen in duodenal contents, 119	gunshot, excision and suture of, under local anesthesia, 237 heliotherapy in, 347 of kidney, gunshot, 159 war, shock in, 224 X X-RAYS, 402 in army, 220 in hyperplasia of thymus, 403 in malignant disease, 402 radium and, in treatment of tumors, 274 in uterine hemorrhage, 403 Y YEAST, 404 in acne, 404		
Ulcer, duodenal, 74 diagnosis of, 74 duodenal alimentation in treatment of, 74 fractional test-meal in, 30 healing of, 62 perforations of, 60 treatment of, 75 gastric, diathermy in treatment of, 72 fractional test-meal in, 31 healing of, 62 perforations of, 60 peptic, medical versus surgical treatment of, 58 Ulceration, intestinal, fecal analysis in, 82 Urethra, diseases of, 199 Uric acid, urea and creatinin, 144 Urine, effect of pituitrin on, 366 Urobilin and urobilinogen in duodenal contents, 119 Urticaria, renal insufficiency in, 157	gunshot, excision and suture of, under local anesthesia, 237 heliotherapy in, 347 of kidney, gunshot, 159 war, shock in, 224 X X-rays, 402 in army, 220 in hyperplasia of thymus, 403 in malignant disease, 402 radium and, in treatment of tumors, 274 in uterine hemorrhage, 403 Y YEAST, 404		
Ulcer, duodenal, 74 diagnosis of, 74 duodenal alimentation in treatment of, 74 fractional test-meal in, 30 healing of, 62 perforations of, 60 treatment of, 75 gastric, diathermy in treatment of, 72 fractional test-meal in, 31 healing of, 62 perforations of, 60 peptic, medical versus surgical treatment of, 58 Ulceration, intestinal, fecal analysis in, 82 Urethra, diseases of, 199 Uric acid, urea and creatinin, 144 Urine, effect of pituitrin on, 366 Urobilin and urobilinogen in duodenal contents, 119	gunshot, excision and suture of, under local anesthesia, 237 heliotherapy in, 347 of kidney, gunshot, 159 war, shock in, 224 X X-RAYS, 402 in army, 220 in hyperplasia of thymus, 403 in malignant disease, 402 radium and, in treatment of tumors, 274 in uterine hemorrhage, 403 Y YEAST, 404 in acne, 404 in furnuculosis, 404		
Ulcer, duodenal, 74 diagnosis of, 74 duodenal alimentation in treatment of, 74 fractional test-meal in, 30 healing of, 62 perforations of, 60 treatment of, 75 gastrie, diathermy in treatment of, 72 fractional test-meal in, 31 healing of, 62 perforations of, 60 peptic, medical versus surgical treatment of, 58 Ulceration, intestinal, fecal analysis in, 82 Urethra, diseases of, 199 Uric acid, urea and creatinin, 144 Urine, effect of pituitrin on, 366 Urobilin and urobilinogen in duodenal contents, 119 Urticaria, renal insufficiency in, 157	gunshot, excision and suture of, under local anesthesia, 237 heliotherapy in, 347 of kidney, gunshot, 159 war, shock in, 224 X X-RAYS, 402 in army, 220 in hyperplasia of thymus, 403 in malignant disease, 402 radium and, in treatment of tumors, 274 in uterine hemorrhage, 403 Y YEAST, 404 in acne, 404		
Ulcer, duodenal, 74 diagnosis of, 74 duodenal alimentation in treatment of, 74 fractional test-meal in, 30 healing of, 62 perforations of, 60 treatment of, 75 gastric, diathermy in treatment of, 72 fractional test-meal in, 31 healing of, 62 perforations of, 60 peptic, medical versus surgical treatment of, 58 Ulceration, intestinal, fecal analysis in, 82 Urethra, diseases of, 199 Uric acid, urea and creatinin, 144 Urine, effect of pituitrin on, 366 Urobilin and urobilinogen in duodenal contents, 119 Urticaria, renal insufficiency in, 157 Uterine bleeding, thyroid extract in, 392	gunshot, excision and suture of, under local anesthesia, 237 heliotherapy in, 347 of kidney, gunshot, 159 war, shock in, 224 X X-RAYS, 402 in army, 220 in hyperplasia of thymus, 403 in malignant disease, 402 radium and, in treatment of tumors, 274 in uterine hemorrhage, 403 Y YEAST, 404 in acne, 404 in furnuculosis, 404 Z		
ULCER, duodenal, 74 diagnosis of, 74 duodenal alimentation in treatment of, 74 fractional test-meal in, 30 healing of, 62 perforations of, 60 treatment of, 75 gastric, diathermy in treatment of, 72 fractional test-meal in, 31 healing of, 62 perforations of, 60 peptic, medical versus surgical treatment of, 58 Ulceration, intestinal, fecal analysis in, 82 Urethra, diseases of, 199 Uric acid, urea and creatinin, 144 Urine, effect of pituitrin on, 366 Urobilin and urobilinogen in duodenal contents, 119 Urticaria, renal insufficiency in, 157 Uterine bleeding, thyroid extract in, 392	gunshot, excision and suture of, under local anesthesia, 237 heliotherapy in, 347 of kidney, gunshot, 159 war, shock in, 224 X X-RAYS, 402 in army, 220 in hyperplasia of thymus, 403 in malignant disease, 402 radium and, in treatment of tumors, 274 in uterine hemorrhage, 403 Y YEAST, 404 in acne, 404 in furnuculosis, 404 Z		









University of Toronto Biological Library

Biological & Medical Serials

DO NOT
REMOVE
THE
CARD
FROM
THIS
POCKET

Acme Library Card Pocket Under Pat. "Ref. Index File" Made by LIBRARY BUREAU

